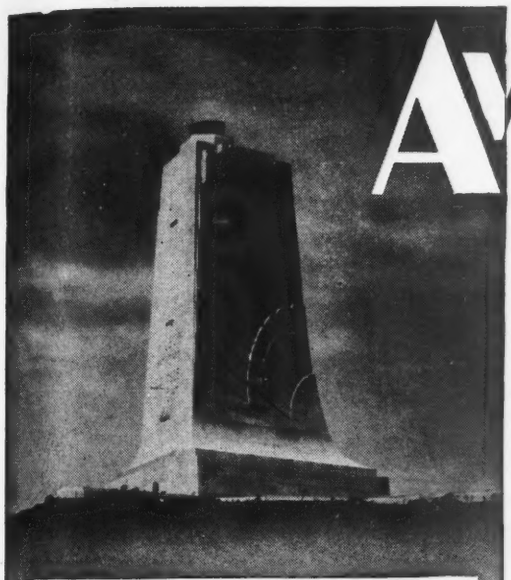

AVIATION

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SEALS AGAINST

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3. Vibration

J-M Inconel Packings

The same high temperatures, vibration and corrosion that caused packing problems in combat aviation can be met by the same solution in commercial, high altitude flying.

The same packings developed by Johns-Manville engineers to seal exhaust manifolds in B-29's, P-38's, P-47's and other war planes—are available now to resist the destructive effects of corrosive fumes at temperatures up to 2000° F. in peacetime aircraft.

J-M Inconel Packings, in coil and tape forms, are made of fine Inconel wire, both with and without asbestos filler, knit into mesh and tightly braided. Resistant to intense heat and corrosion, these packings are unusually resilient and flexible, absorbing the vibration between moving and stationary parts of the exhaust system. Expansion joints are tightly sealed even in the stratosphere, preventing dangerous gases from seeping into the plane and minimizing fire hazards.

Johns-Manville makes a complete list of packings for industry, many of them designed especially for airplane engines, propellers and exhaust systems. For details, write for the J-M aviation brochure, AV-1A. Johns-Manville, 22 East 40th Street, New York 16, New York.

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J-M PRODUCTS FOR THE AVIATION INDUSTRY

Packings and Gaskets · Friction Materials
Insulations · Asbestos Textiles · Transite Conduit
Transite Pipe · Industrial Building Materials

It is more than a pleasure to present herewith, our 13th Annual Directory Issue—for this first postwar year brings the opportunity to publish our Airshow in Print, featuring American Personal Planes. Through 97 engineering drawings and photographs, together with descriptive captions, we present data on 57 American personal planes and helicopters which are currently in production or under development. Also taking "floor space" in our Airshow are 28 of the latest American, British, and Canadian transport craft. In addition, all available data are offered on the newest developments in the military field—bombers, fighters, and guided missiles. And our perennially-useful American and foreign aircraft specification tables are again augmented by our special helicopter tables—plus the first published specification listing on turbojet power plants, this table covering American, British, and German developments. Still another added feature, in this first postwar year, is AVIATION'S Showplace of Accessories & Field Units, with emphasis on products the personal plane distributor and owner will want to know about. As has become customary, a greatly enlarged Sketchbook of Design Detail in color is likewise included. The Yearbook begins with its own special table of contents on page 87.

Giving the Yearbook even greater usefulness are four special feature presentations. In the first, beginning on page 72, the editors have compiled and condensed in readily useful easy-to-read form a wealth of statistical material—data giving at a glance the industry's record before and during the war and marking the sweep of predicted trends as a clue to the future course. In the second of these specials, on pages 76 and 77, our Financial Editor gives the dollars-and-cents slant and, with the keen foresight for which he is well known, examines the all important profit prospects for the industry as a whole. Next, beginning on page 78, AVIATION'S Canadian Correspondent James Montagnes reviews the record and looks well into the future of aircraft manufacturing, transport, and personal flying in the Dominion. And from "Down Under," AVIATION'S Australian Correspondent H. Bowden Fletcher specifies how this Commonwealth is working to become a factor in the aircraft manufacturing field. His analysis begins on page 80.

***Ernie Stout,** Convair's Staff Engineer in Charge of Hydrodynamics, Design Development Staff, installs a controllable pitch propeller on radio-controlled free-flight model used in research. Such scale craft have been found to give accuracy unattainable by other test methods, with the result that countless bugs can be designed-out of projected large aircraft, with tremendous savings in time and money. Engineer Stout gives the first details of the method in his story beginning on page 171.*

All the aircraft types presented in our Airshow can mean only one thing—there's going to be a lot more flying around this country than ever before. And this means insurance will have to get out of the weather category—there'll have to be more than just talk. Making an early promotional move in this direction, we present the first of a cogent series on insurance. Written by R. L. Templeton, a returned military pilot now consulting on aviation insurance matters, it gives real sales ammunition to personal plane dealers and distributors. Turn to page 82.

This month we begin a very valuable series for all those connected with the distribution, operation, and maintenance of aircraft—and those who plan any of those activities—for it will cover all the major phases of successful business procedure. The first article, for example, details the important "why's" and "why nots" of the type of organization for the enterprise. Prepared by Maj. Charles A. Parker who has just returned from worldwide military service, this series is written on the basis of long prewar experience with one of New England's most successful fixed base operations. See page 84.

Down the Years in AVIATION'S Log

25 Yr. Ago (1921)—Gen. Mitchell declares that aircraft have made capital warships obsolete. . . . Los Angeles innovates municipal airport for public use. . . . Aeronautical Society of Alabama organized. . . . Minnesota Air Squadron (N.G.) organized. . . . U. S. exported $36,166,564 worth of aircraft to date. . . . NACA states airmail will be justified by results. . . . Kansas passes first state air laws. . . . Agricultural press advocates seeding crops by airplane. . . . British magazine "The Aeroplane" prophesies Japan will attack U. S. by air. . . . U. S. Purchases Italian dirgible "Roma." . . . Glenn Martin produces new high-lift wing with highest loading to date.

15 Yr. Ago (1931)—Gen. Italo Balbo flies 10-plane squadron of Savoia seaplanes from Italy to Brazil. . . . Peruvian Government signs trans-Atlantic airmail contract with French Aeropostale Co. . . . Records show total of 1,000,000 lb. of airmail and 34,058 passengers flew from Newark Airport in 1930. . . . Navy signs contract for $15,500,000 aircraft carrier, first specifically designed flat-top. . . . Douglas reports 70% increase in business in past year.

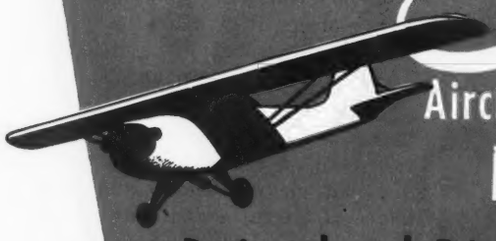
10 Yr. Ago (1936)—Douglas exhibits initial DST and DC-3 at Los Angeles air show. . . . AA orders 15 DC-3s, Army orders 90 Douglas bombers, and Navy 114 torpedo planes from same firm. . . . Lockheed 12, 8-place transport, placed on market. . . . Western Electric tests first directional loop antenna. . . . Boeing announces it now has 1,500 employees, while Consolidated has 1,450, and Douglas employs 4,000. . . . Howard Hughes breaks transcontinental record, flying Wright Cyclone-powered Northrop Gamma. Time: 9 hr. 27 min.

Standard Altimeter — Range 20,000 ft. Settable pointer, 10,000 ft. per revolution. Barometric subdial. $24.00

Sensitive Altimeter — Range 20,000 ft. 1,000 ft. per pointer revolution. 20-foot graduations. $70.00

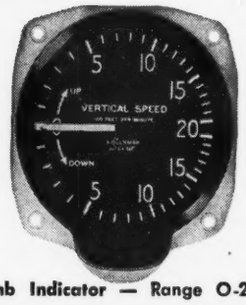
Air Speed Indicator — Furnished in 160, 200 and 250 MPH models. Connections in rear of case. $24.00

The New Scout



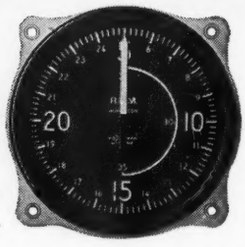
Aircraft Instruments by KOLLSMAN

Designed and Priced Especially for the Private Plane

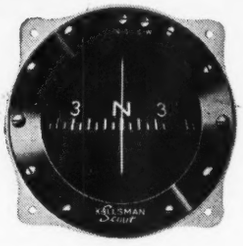


Climb Indicator — Range O-2000 feet per minute. Zero adjustment. Widely spaced graduations. $50.00

Manifold Pressure Gage — Range 10 to 50 in. of mercury. Temperature compensation. $30.00



Tachometer — Centrifugal type. 500 to 3,500 RPM, 1½ pointer revolutions. Shaft direct to engine. $42.00



Compass — Standard 3⅛" mounting. Compensating screws. Compensating card. $30.00; Std. 2¼" unit, $24.00

All instruments (except small compass) fit AN standard 3⅛" mounting holes with cutouts for adjustment or setting knobs. Flight instruments have radium luminous dials which also react to fluorescent "black" light

Kollsman has created the new Scout line of instruments to bring Kollsman accuracy and dependability to the private plane owner at a price within his reach.

This has been accomplished by redesigning Kollsman airline and military instruments to the less extreme performance requirements of the private plane, thus making for substantially lower manufacturing costs.

Thus, the new Scout line offers rugged, accurate, trustworthy instruments of a quality never before within the reach of the average private owner. With these instruments the private plane can now enjoy a new measure of safety and utility based on instrument accuracy and dependability.

Accept nothing less than Scout instruments on the plane you are about to purchase. Back your investment in plane and engine with instruments that will help you realize your ship's full utility. And if you now own a plane, get more all-round use out of it with dependable, low cost Scout instrumentation.

For complete information on Scout Aircraft Instruments write Kollsman Instrument Division, Square D Company, Elmhurst, New York.

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EVERYONE TALKS about aluminum . . . but how many people really *know* it?

Great developments made during the war created unlimited new uses for aluminum . . . expanded tremendously its scope in fields where it had been used before!

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To assist the designer and the industrial engineer Reynolds has prepared a quick digest of products and facilities. Write for your copy of Catalog 100-A, "Reynolds Aluminum: Its Important Role in Tomorrow's Products."

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REYNOLDS METALS

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The Great New Source of **ALUMINUM**

INGOT · SHEET · SHAPES · WIRE · ROD · BAR · TUBING · PARTS · FORGINGS · CASTINGS · FOIL · POWDER

This is the thirty-first of a series of statements by aviation's leaders on THE SHAPE OF FLYING TO COME

"Let's locate our airports so that anybody can fly anywhere at any time," *says W. T. PIPER, President, Piper Aircraft Corporation*

"THE REAL OPPORTUNITY *of the personal plane lies in providing unscheduled transportation between a large city and a small one or from one village to another where airline systems are not developed and other means of transportation are poor.*

"But this opportunity will not be realized unless airports are properly located. Personal plane trips are so short that distance to the airport *is an important factor.*

"Big cities should be entirely circled by small landing fields to develop personal plane commuter travel. Every summer resort and beach would be greatly benefited if a small landing area or airport were built close to it, while narrow landing strips along our highways would make personal airplane trips possible to almost every home in the United States.

"To make a broad statement, I would say that wherever the time in the air plus time on the ground *is less than the time required to make the trip by auto, the personal plane has utility. The airports and airstrips we build today may be used by generations of pilots, so let's make sure they are properly located."*

Agreed, Mr. Piper. And first to make their communities airminded like themselves, first to want to make flying a family habit will be the readers of TIME. For TIME's 1,300,000 families have the habit of progress and the annual incomes ($3000 higher than the national average) that permit personal flying.

36,400 TIME families have already owned an airplane and 500,500 more say they hope to some day. In 39,000 TIME-reading families somebody already has a pilot's license.

TIME families are airminded because TIME and the aviation industry have grown up together. It seems only natural they should vote TIME their favorite magazine by a 9 to 1 margin over any other magazine.

Believing that the ideas of aviation's leaders are always of interest to the aviation industry, TIME here gives them wider circulation in the name of

AVIATION'S SILENT PARTNERS

TIME

THE READERS OF TIME

BONNEY "Balanced Design" OPEN END WRENCHES

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Ask your nearby Bonney Tool Distributor or Jobber to show you the complete line of Bonney "Balanced Design" Tools—or write for a copy of the new Bonney Tool Catalog.

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BUY MORE BONDS AND KEEP THEM

BONNEY TOOLS

13,707 Babies prove

BEAUTIFUL *Velon** UPHOLSTERY FABRIC

NEEDS NO BABYING

Seventeen hours a day, seven days a week for a year and a half the Pennsylvania Station Nursery in New York City has played host to thousands of children. Yet the built-in seats, drapes and trim of soft, silvery, pastel *Velon* fabric look as new as the day the nursery was decorated. For grease, dirt and other kinds of soil can't cling to *Velon's* non-porous threads.

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Goodbye high replacement and maintenance cost—no more worn, abused-looking seating! Now you can upholster in clear glowing colors or delicate pastels. Now you can produce luxurious "living-room" interiors to attract passengers—and know that *Velon* seating, wall-lining, curtains, trim will stand up under the most rugged wear.

Consult with Firestone engineers on your specific needs. Write Firestone, Akron, today, for full information. Plan on *Velon*, now.

The perfect seating team—

VELON fabric over FOAMEX* cushioning

Velon's ideal seating mate is Firestone's *Foamex*. Passengers float in blissful relaxation on millions of foamed air-and-latex cells, each a perfect little cushion, each a shock absorber, each a breathing ventilator to keep seating cool and fresh. *Foamex* saves upkeep. It replaces old-style springs and stuffing with a single welded-together material, lump-proof, sag-proof.

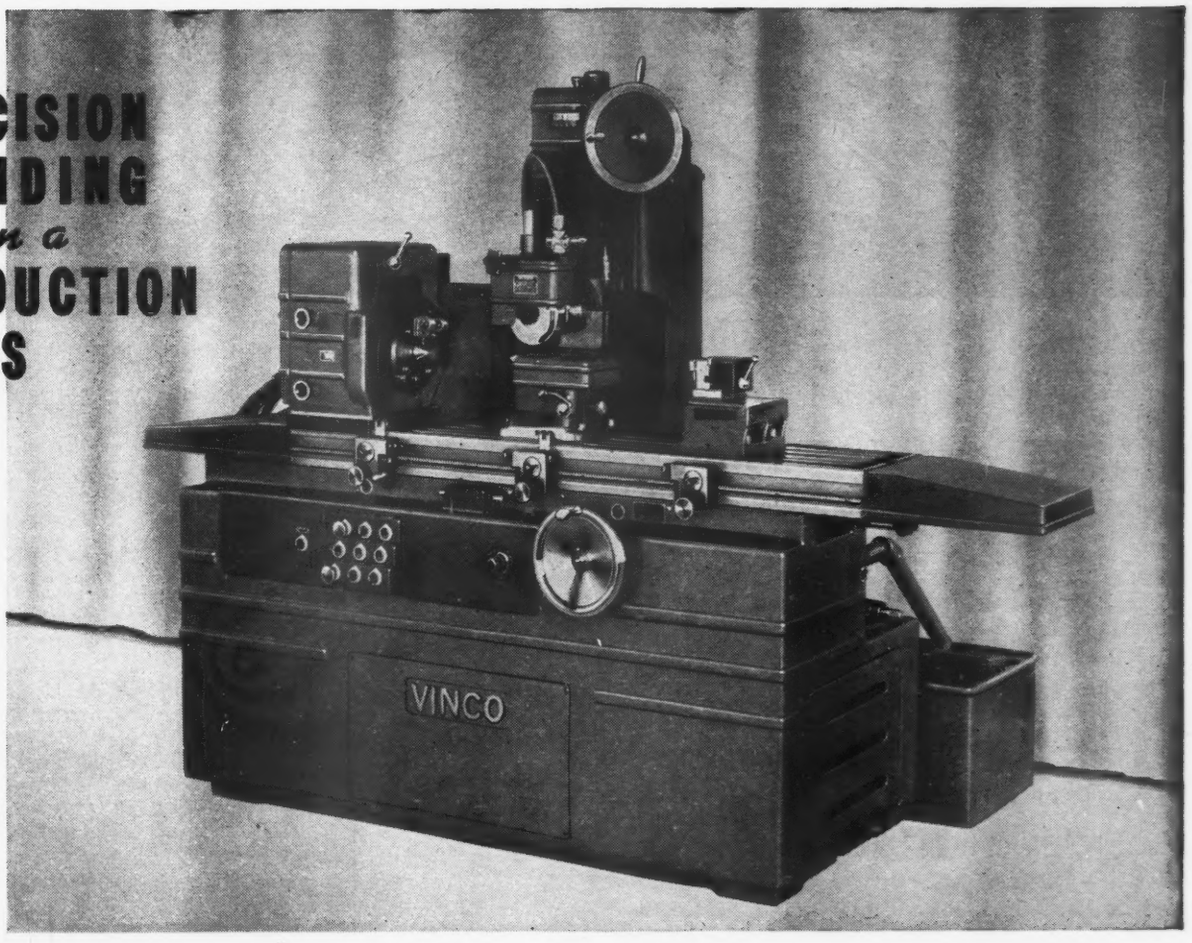
BEST TODAY... STILL BETTER TOMORROW

Firestone

*TRADE MARK

LISTEN TO THE VOICE OF FIRESTONE MONDAY EVENINGS OVER NBC

PRECISION GRINDING *on a* PRODUCTION BASIS



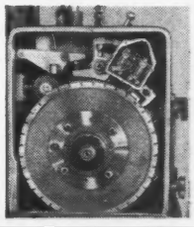
Vitally Important to Modern Gear and Spline Assemblies.

Grinding these related toothed parts to extremely close tolerances is a production problem of deep concern to the gear and spline industry.

The VINCO Semi-automatic Spline and Gear Grinder has solved this problem on every count, according to enthusiastic reports received from its users. Unsolicited verification of its adaptability and precise performance under actual working conditions is welcome news that merits the attention of everyone concerned with gear and spline production.

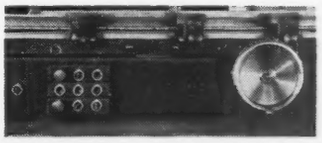
Seeing this grinder in operation is conclusive proof of its important bearing on future spline and gear production. Drop in at VINCO and thoroughly investigate every feature and detail of its construction. See its smooth, silent operation and unerring accuracy, then judge for yourself whether it deserves a place in your production plans.

This is the only way to prove what we and our spline and gear grinder customers already know; that the VINCO Semi-automatic Spline and Gear Grinder is a definite need in the production of precision gear and splined parts.



The Index Head

Guaranteed that spacing error of notches in plate will not exceed .0003" between any two notches



The Control Panel

Simplicity of control makes it possible for any semi-skilled operator to get top production with little training.

MILLIONTHS OF AN INCH FOR SALE BY VINCO

REG. U. S. PAT. OFF.

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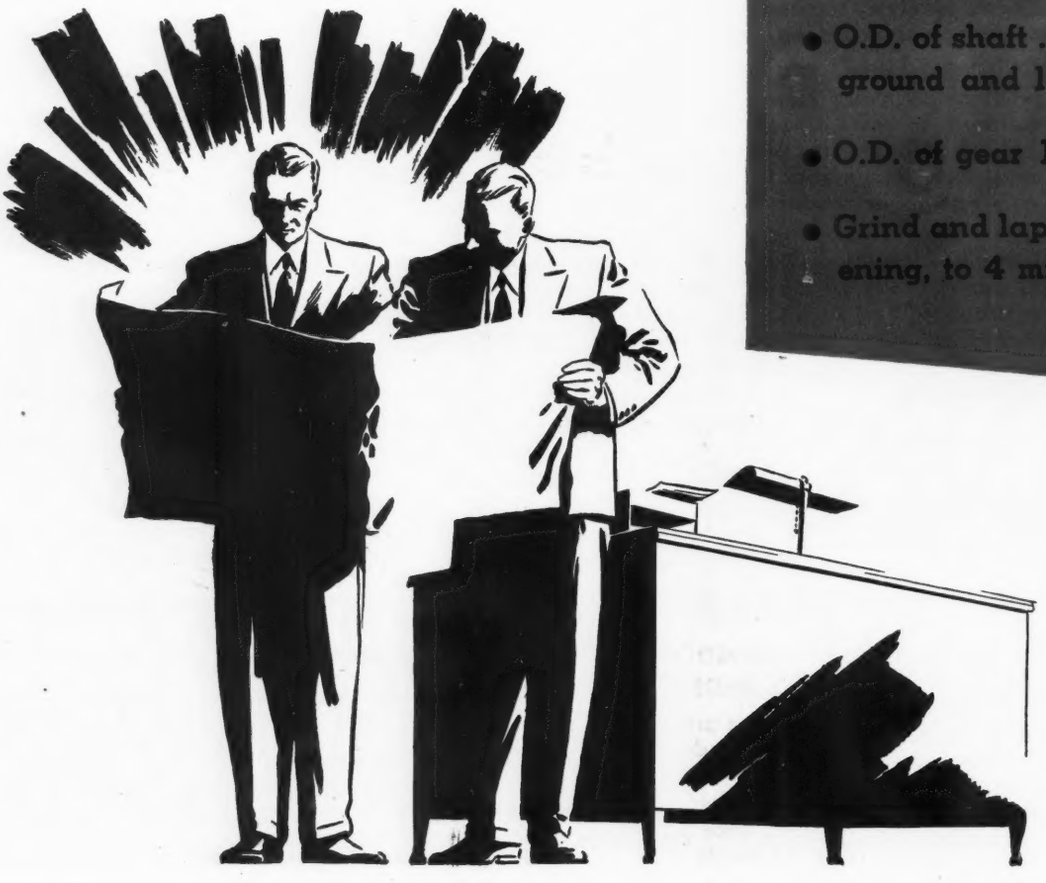
They Came to

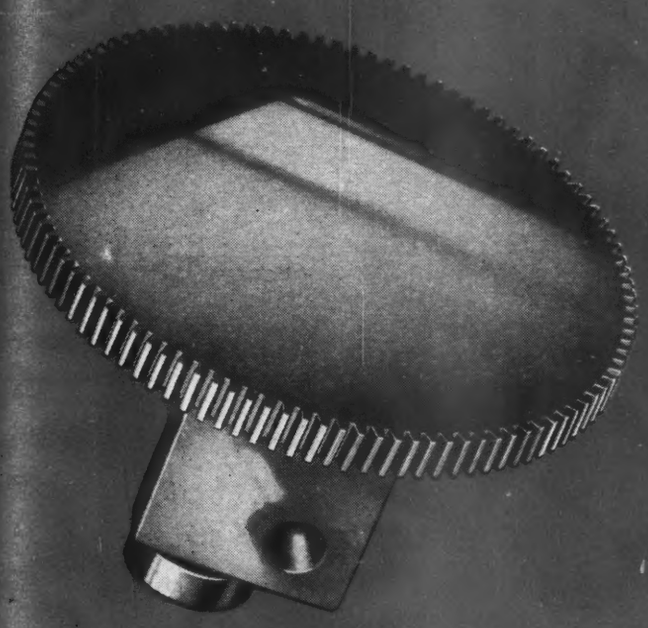
***With problems that had to be whipped*— problems with neither formula nor precedent as a guide to their solution. That we did whip them is water over the dam, and, if they didn't have an important bearing on future precision products, we would never mention them. Take for instance the specifications for this variable speed drive disk, shown here, as one example of precision production.**

Specifications

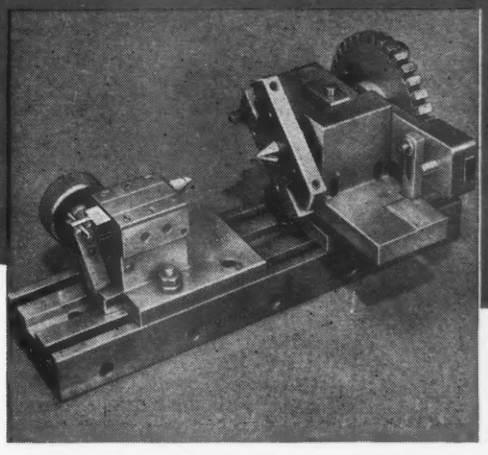
- 14½° pressure angle, spur gear
- 106 teeth—64 D. P.
- pitch dia. 1.6562″ $^{+.0}_{-.0005}$
- root dia. 1.620″
- tooth thickness .0245″
- P. D. and O. D. concentric with .2498″ diameter shaft within .0005″ total indicator reading.
- O.D. of shaft .2498″ ground and lapped $^{+.0}_{-.0002}$
- O.D. of gear 1.6875″ $^{+.0}_{-.001}$
- Grind and lap face, after hardening, to 4 micro inches.



VINCO

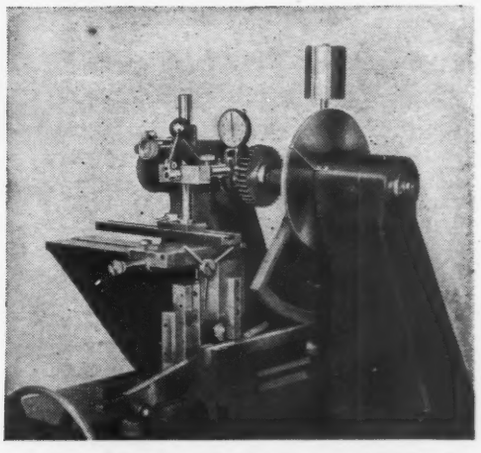


We were able to hold all specified tolerances and produce these parts in quantity by using the VINCO Spline and Gear Grinder, the VINCO Involute Checker and VINCO Precision Centers. These outstanding pieces of equipment are available to you who face production and inspection problems of a similar nature. For further details concerning these machines write VINCO or call in one of our Sales Engineers. Sales offices are located in New York City, Cleveland and Chicago.



VINCO GRINDING CENTERS AND INDEX PLATE

For use on surface grinders. Job capacity up to 4" dia. Hardened, ground steel base. Headstock with spindle. Tailstock has retractable center. Spindle may have work driver or face plate together with index plate or crank.



THE VINCO INVOLUTE CHECKER

Made with ten or twenty inch base circle disk. Checks gears or splines of any pressure angle, pitch or degree of involute roll. Four models with special applications completely cover individual needs. Tell us your requirements.

Exide

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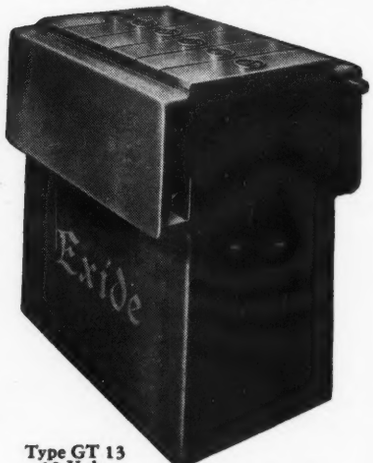
Type 6FHG13
12 Volts
AIR TRANSPORT BATTERY
Used by leading airlines

Type 6TS9F
12 Volts
PERSONAL PLANE BATTERY
For lights, radio and starting

Type 12TS9L
24 Volts
MILITARY TYPE BATTERY
For military and reconverted Government planes

Type 3AC7
6 Volts
LIGHT PERSONAL PLANE BATTERY
For ignition and small lighting loads



Type GT 13
12 Volts
ADVANCED TYPE BATTERY
For extra duty

Peacetime planes need lasting clear vision, too

MR. R. S. JOHNSON, Johnson Aircraft, Inc., Fort Worth, Texas, manufacturer of the Rocket 185, says, "The Rocket is one of the most modern small airplanes now on the market, offering many advanced features of safety, cruising flexibility, comfort and performance. The Rocket has an automatic variable pitch propeller; hydraulic flaps; wing tips designed to give control at low speed without slots; fuselage of chrome molybdenum steel. Its cruising speed is 185 miles per hour; refinements such as deep leather upholstery and ample room for 3 passengers—these and many other features testify to its careful design."

"The Rocket 185 uses 'Lucite' for windshield, windows, and door," says Mr. R. S. Johnson, the plane's designer and builder, "because 'Lucite' has proved to be a superior product. It has been found to be economical also, because it is strong for its weight, easy to work with, and being resistant to the effect of weather and sun rays, it retains its transparency."

When you install "Lucite," *you can expect it to last in normal service for the life of the plane.* Its excellent transparency lasts because the plastic resists the effects of sunlight, moisture, and changes in temperature. "Lucite" is strong and its high modulus of elasticity helps prevent excessive flexing or loosening of enclosures under flight load. "Lucite" can be readily heated and formed into extreme contours, and easily machined and mounted.

"Lucite" methyl methacrylate resin costs much less than you think—there were *five* price reductions during the past 4 years. Are you sure you have all the facts about this long-lived plastic? Write for free booklet on "Lucite" for aircraft designers, engineers, production men. E. I. du Pont de Nemours & Co. (Inc.), Plastics Dept., Arlington, N. J., or 5801 S. Broadway, Los Angeles 3, Calif.

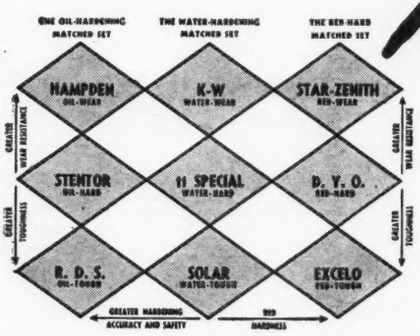
DU PONT
REG. U. S. PAT. OFF.
Plastics
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

Follow these steps
TO GET LONGER TOOL LIFE!

1 *Get acquainted* with the Matched Set Diagram

These are really Matched Tool Steels, as one picks up its job where the other "leaves off."

The key steel is the one in the center, No. 11 Special, a straight carbon, tough timbre, water-hardening tool steel. When you have a tool to make, you first find out if it can be made from No. 11 Special. If the answer is "Yes", you go no further. But when the answer is "No", you use the diagram to point the way to the tool steel that will do the job. For greater wear resistance, you go north. For greater hardening accuracy and safety, you move west. Just follow the diagram.



2 *Ask for a copy of* this Tool Steel Manual

It carries the *Matched Set Diagram* one step further.

In addition to helping you get the most from the diagram, this Manual contains an 80-page *Tool Index and Steel Selector*. Just flick the indexed pages to find the tool steel recommended for any one of more than 200 types of tools! And the *Carpenter Matched Tool Steel Manual* is saving time in heat treating departments, too. It gives complete, simplified heat treating instructions that protect the hours of skilled labor that go into tool making.

For your free copy of the *Matched Tool Steel Manual,* just drop us a note on your company letterhead.

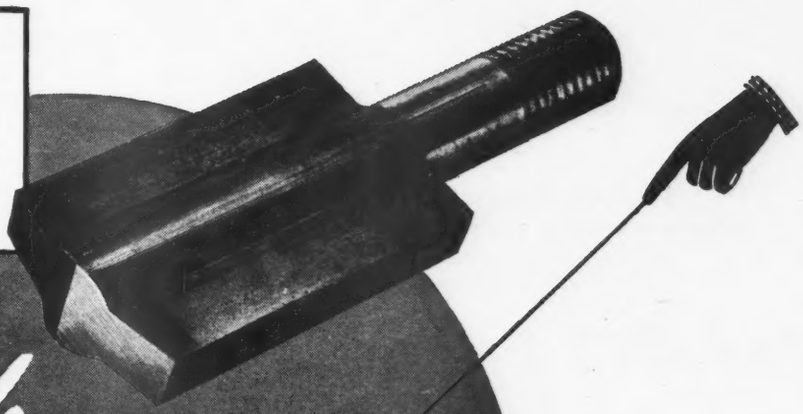
3 *Make use of* this Tool Steel Experience

In your tool room, heat treating department or production shop—here is another way to help get the most from every pound of tool steel you use.

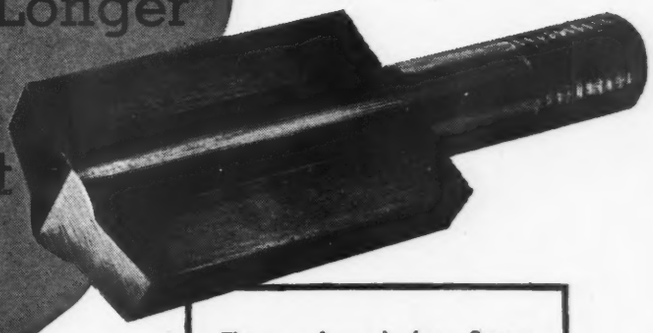
Get in touch with your nearby Carpenter representative and let him put his diversified experience to work for you. He knows tool steel inside and out, and can offer practical suggestions that get problems licked faster. Get in touch with him about that trouble-shooting job of yours, and he will help you get started on the Matched Set Method.

The Standard Tool Steels of Industry

This tool for punching 3/16" thick O.H. steel sheet was made from a tool steel that promised to provide the *toughness* needed on the job. But excessive wear meant that the punch had to be reground after 190,000 holes had been punched.



Which
OF THESE TWO TOOLS
Will Stay On The Job Longer and Increase Machine Output Per Month?



This punch made from *Stentor* tool steel provided just the right combination of toughness and wear resistance for the job. With it, production jumped over 100% —to 387,000 holes between grinds!

here is WHY one tool does a better job...

Good tool steel is only *one* of the answers to getting tools that stay on the job longer.

But to get best possible results, you need more than that.

A tool giving 100% more production isn't just a stroke of luck! The tool room foreman knew what he needed for the job. He had found a *definite system* for picking the one tool steel that would do the job best. And as the heat treater had complete, easy-to-use instructions, they got real results right off the bat!

You can do the very same thing, by simply following the steps on the opposite page. Carpenter can give you a *definite system* for quickly finding the right tool steel for each job. You'll save time and have fewer tools to make. And when you put Carpenter's heat treating information to work on your jobs, watch the headaches disappear.

To find the road that leads the way to better tools, more output from each machine and press, follow the steps on the opposite page.

THE CARPENTER STEEL COMPANY • 128 W. Bern St., Reading, Pa.

Carpenter **MATCHED TOOL STEELS**

BRANCHES AT Chicago, Cincinnati, Cleveland, Detroit, Hartford, Indianapolis, New York, Philadelphia, Providence, St. Louis

Announcing the

KEARNEY & TRECKER
MILWAUKEE

Model TT Precision Milling and Boring Machine

Scientifically constructed for accurate and convenient operation, the Model TT Precision Milling and Boring Machine enables the operator to mill and bore a workpiece from two sides without changing the setup —an answer to your difficult milling and boring problems that require exceptional precision. Convenient operation is of paramount importance on any machine tool. This machine provides dual table controls on each side of the bed. Each upright is a complete unit in itself with column and spindle controls. A swiveling control pendant provides complete control from the most advantageous operating position at each column.

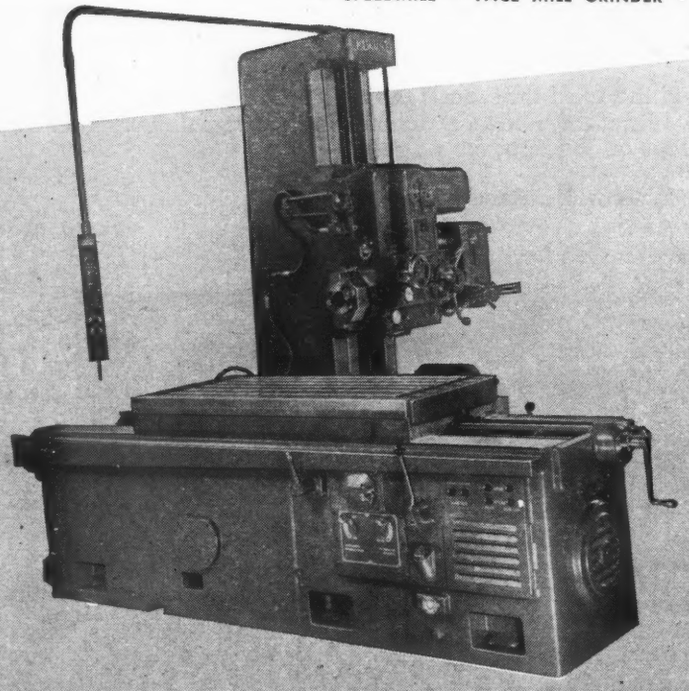
Features of operation and construction that make this machine outstanding in precision operation and versatility are —

- The No. 50 National Standard spindle nose to accommodate modern milling tools.
- Spindle rotation of both spindles in either direction permit the use of right or left hand milling cutters.
- A wide range of speeds and feeds are available for the efficient use of modern cutting tools on a wide variety of operations.
- A thread cutting feature provides boring and thread cutting on two sides of a workpiece in a single setup.

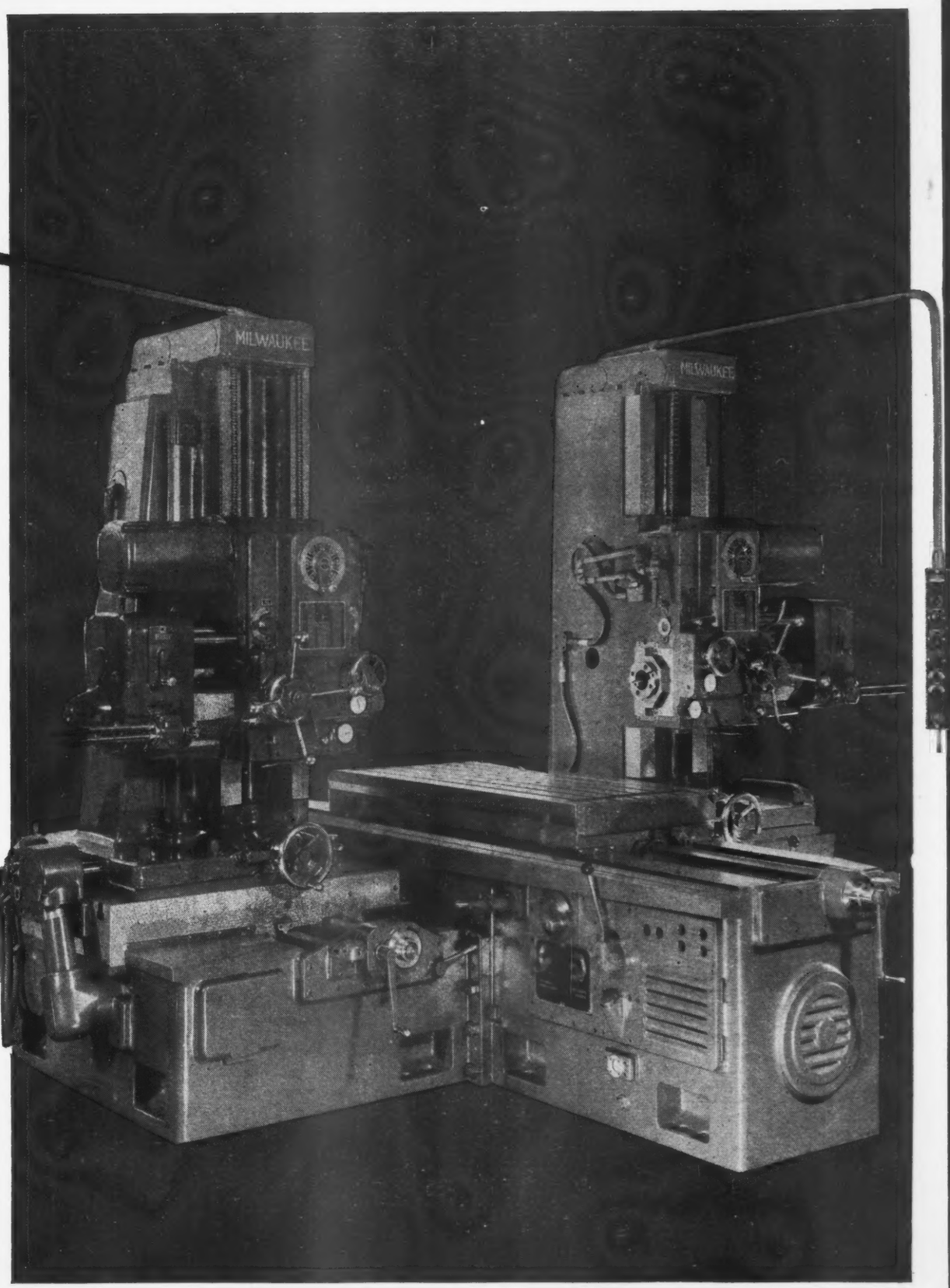
Write for Catalog T11, a complete descriptive catalog on the Model T and the Model TT Precision Milling and Boring Machine.

KEARNEY & TRECKER
Products
CORPORATION
MILWAUKEE 14, WISCONSIN
Subsidiary of Kearney & Trecker Corporation

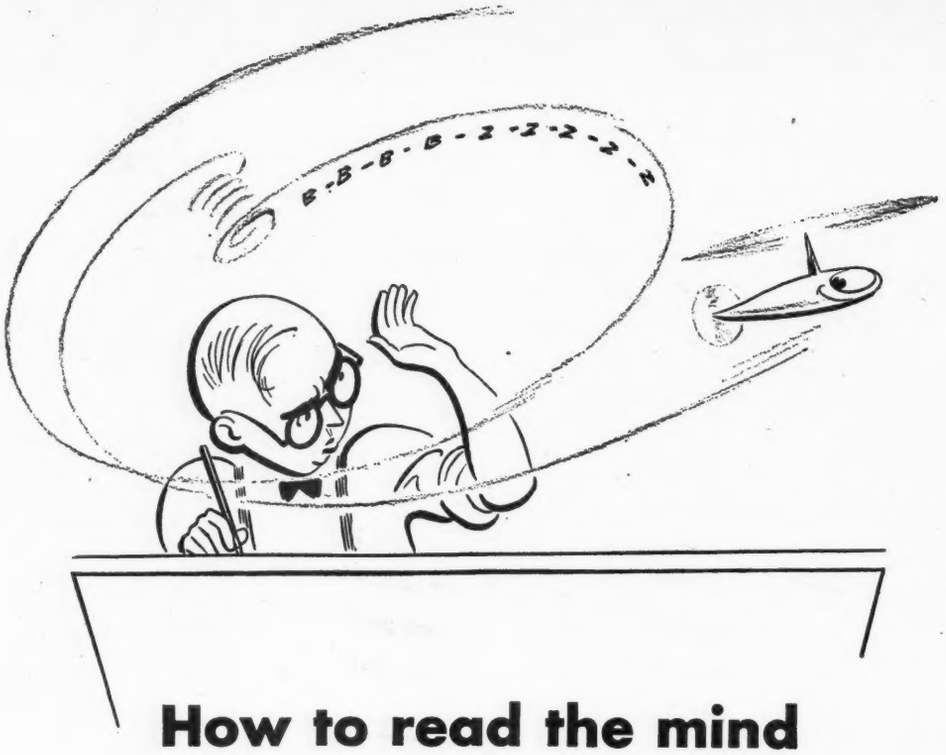
BUILDERS OF MILWAUKEE ROTARY HEAD MILLING MACHINE • MIDGETMILL • SPEEDMILL • FACE MILL GRINDER • AUTOMETRIC BORING MACHINES.



The Model T Precision Milling and Boring Machine, a single spindle machine, is the companion to the Model TT. It is an ideal machine for precision work in the toolroom where great accuracy is required.



KEARNEY & TRECKER
MILWAUKEE
Precision Milling and Boring Machine
No. 3 MODEL TT



How to read the mind of an aircraft designer

The thing to remember about reading an aircraft designer's mind is that it doesn't read from past to present, the way an average mind does, but from the future to the present. He starts with a set of ideal flight characteristics and works back to what can be done this year or next.

Learning to think that way, too, is how Fafnir came to be the largest supplier of ball bearings to the industry.

Take the helicopter, for example; it takes a lot of Fafnir Ball Bearings . . . some of them as unconventional as the helicopter itself. Like the blade retention duplex ball bearing which has to handle the tremendous thrust load of the rotor blades or the bracelet-like dual ball bearing for the rotor cyclic pitch control. Others, such as the "K" Series and rod end bearings for the control system, the bearings for the rotor shaft and the gear box and transmission, are adaptations of standard Fafnir Ball Bearings.

These Fafnirs have one thing that makes them better for their "tomorrow job" than any other bearings. Fafnir Engineers were working with the designers . . . in the same direction, ahead into the future. Which explains why more Fafnirs are used in the aircraft of today and tomorrow than the bearings of all other makes combined. The Fafnir Bearing Company, New Britain, Connecticut.

FAFNIR

BALL BEARINGS

For Aircraft

LEATHER

is the most dependable material for thousands of mechanical applications

PACKINGS...

... made from selected leathers provide positive sealing for air, water, oils, chemicals and gases, under various pressures, when properly designed and developed to suit the purpose.

ENGINEERED...

... by Chicago Rawhide, since 1878 literally thousands of Sirvis leather packings have been developed to meet special needs and have never failed to deliver the maximum in dependable quality and service.

TO YOUR NEEDS...

... Sirvis engineers will design and develop special packings or any other mechanical leather products. You may be sure too, that each unit will be manufactured exactly to your specifications in design, hardness, flexibility, strength, sealing qualities or whatever other characteristics you may require. Try *Sirvis* first.

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MECHANICAL LEATHERS

Products of

CHICAGO RAWHIDE MANUFACTURING CO.

1305 Elston Avenue **Chicago 22, Illinois**

New York • Philadelphia • Detroit • Los Angeles • Cleveland • Boston
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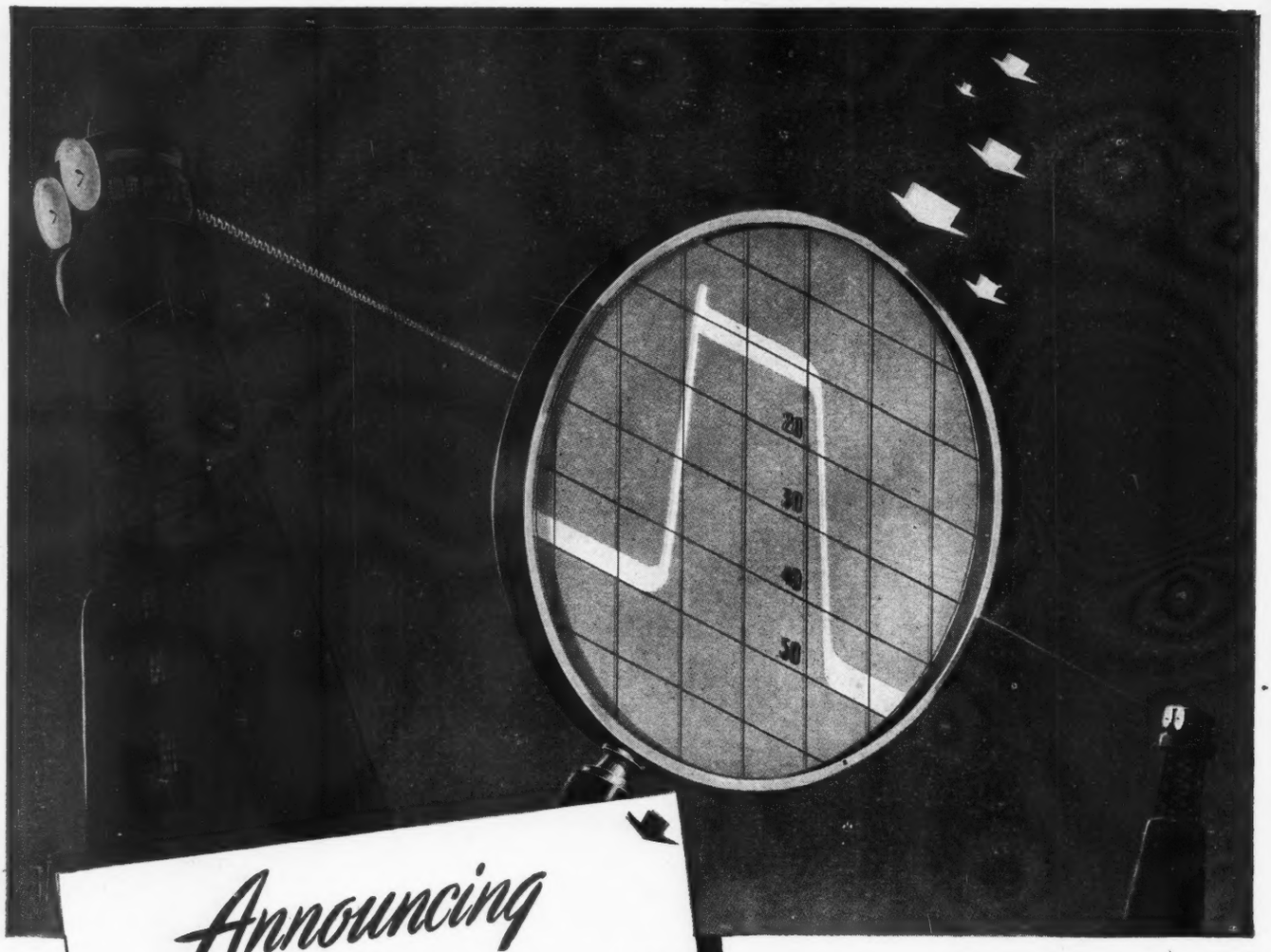

Announcing

THE NEW SPERRY *Microline**

As a reading glass aids visual search, so MICROLINE test and measurement equipment provides means for making all measurements at microwave frequencies.

Sperry announces a comprehensive line of microwave test and measurement equipment for laboratory and field use. The new line... the MICROLINE...is the outgrowth of years of research and experience in modern microwave techniques beginning with the development of the Klystron.

Write our Special Electronics Department for further information.

Available now:

WAVEMETERS • WATTMETERS
BARRETTER ELEMENTS AND MOUNTS
DIRECTIONAL COUPLERS
KLYSTRON SIGNAL SOURCES
STANDING WAVE DETECTORS
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SPERRY GYROSCOPE COMPANY, INC. GREAT NECK, N. Y.

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LOS ANGELES • SAN FRANCISCO • SEATTLE • NEW ORLEANS
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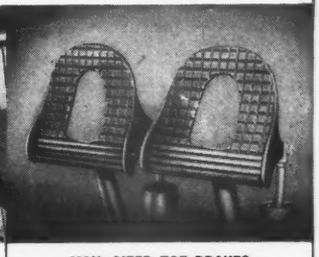
ANNOUNCING

the FIRST of a Complete, New Line of FINE Personal Aircraft

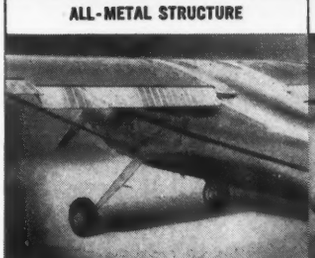
THE CESSNA 140

Only the Cessna 140 gives you *ALL* these features in the low-priced field

ALL-METAL STRUCTURE



MAN-SIZED TOE BRAKES



FULL-RANGE FLAP CONTROL

PATENTED, SAFETY LANDING GEAR

At Your Dealer's in March

There's something in the air! It's the new Cessna 140, a new high in light airplane performance, speed and value.

Here are the highlights. The Cessna 140 is a two-place, side-by-side airplane with an 85 h. p. Continental engine.

This fast, safety-engineered Cessna gives you a full 4-hour gasoline capacity, positive-action hydraulic brakes, self-starter and generator, navigation lights and the patented Cessna safety landing gear that tiptoes across rough fields, taxis easily even in high winds that keep most light airplanes in the hangar, and actually combats ground-looping tendencies. Another big plus is that standard equipment on the 140 includes flaps with full range control for both glide angle in landing and extra lift for short take-offs.

The sound-proofed, beautifully upholstered cabin has excellent visibility including wide-vision rear windows. Priced at *less than* $3000.00 F. O. B. Wichita, this new Cessna 140 is the plane that you should fly before you buy your personal plane.

The Cessna 120 also gives you all the advantages of all-metal structure, an 85 h. p. Continental engine, the patented, safety landing gear, sun-proof Plexiglas windshield, 2 wide cabin doors, 4-hour fuel capacity . . . but it is not equipped with starter, generator and flaps . . . to deliver for less than $2500.00 F. O. B. Wichita! Be sure to see these two high-performance, safety-engineered personal planes at your dealer's in March. Don't buy any airplane until you fly the new . . .

Four High-Performance Metal Airplanes For You To Choose From In 1946

In addition to the Cessna 140 and the 120 in the low-priced field, Cessna will introduce two new, all-metal, four-place models . . . the 170 and the 190 in the summer of 1946. Worthy successors to the famous Cessna Airmaster, three times judged the *World's Most Efficient Airplane*, all four of these new Cessnas are more airplane for your money. Remember, when you start flying, you're a pilot. And you, like thousands of pilots who know, will choose a Cessna.

CESSNA AIRCRAFT COMPANY, WICHITA, KANSAS

Cessna — THE PILOT'S AIRPLANE — ARMY E NAVY

Heated Walls and Floors Keep Constellations Comfortable

IN the design and building of the spectacular new Constellation, Lockheed engineers have incorporated every possible advancement to provide the utmost in passenger ease and comfort.

To assure comfortable temperatures under all flying conditions, the Constellation is heated throughout with Janitrol Whirling Flame combustion-type heaters.

Heat from these Janitrol units is directed between walls and floors to provide uniform warmth in passenger and pilots' cabins and the galley. Easy service and accessibility are important features of the heating system.

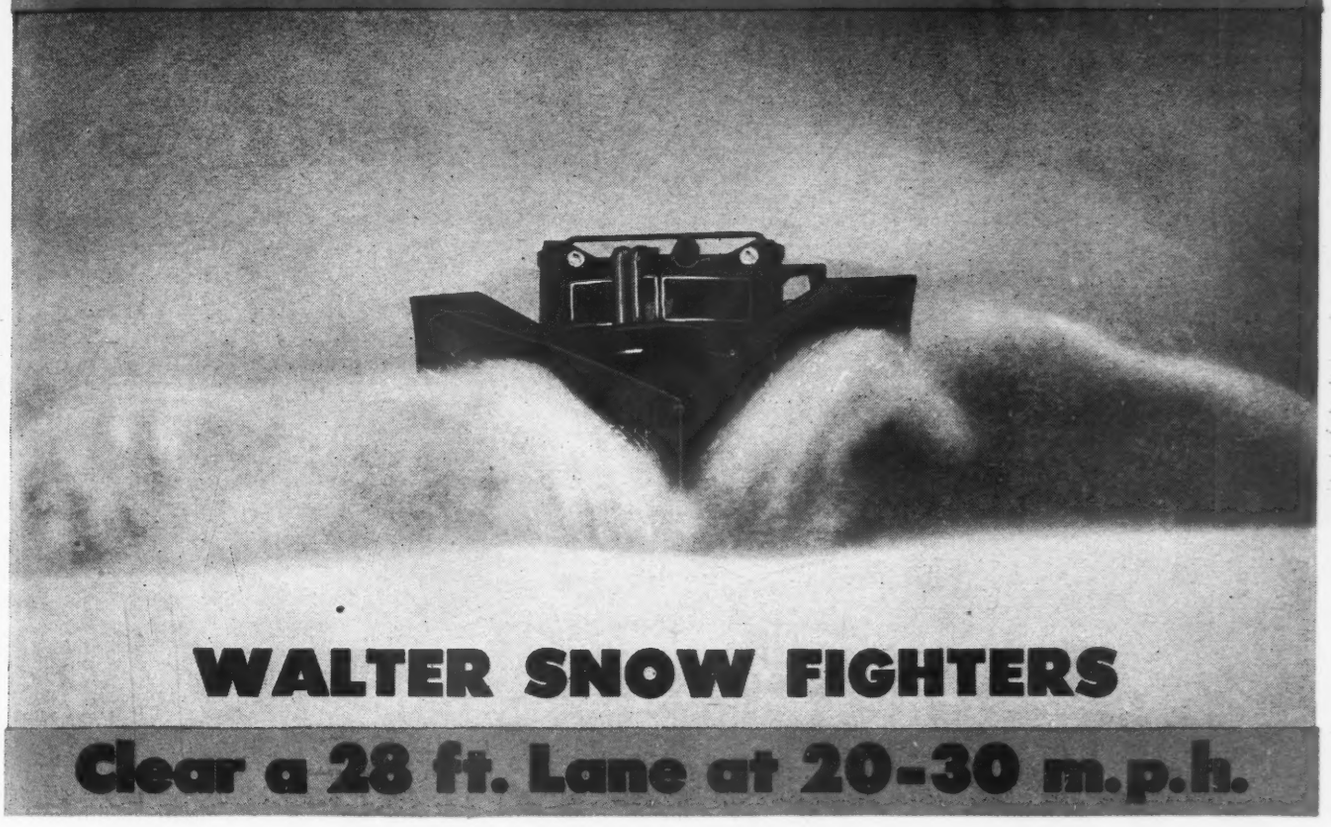
The dependability of Janitrol Whirling Flame Aircraft Heaters has been proved time and time again—for thousands of Janitrols met all the requirements in the rigors of wartime flying.

So, whatever type or size of planes you plan to build or operate, you can be sure that the Janitrol Whirling Flame can heat them better, and more efficiently.

Janitrol

AIRCRAFT HEATER DIVISION • SURFACE COMBUSTION CORPORATION • TOLEDO 1, OHIO

THROWS SNOW *Farther*
because it Clears Faster!

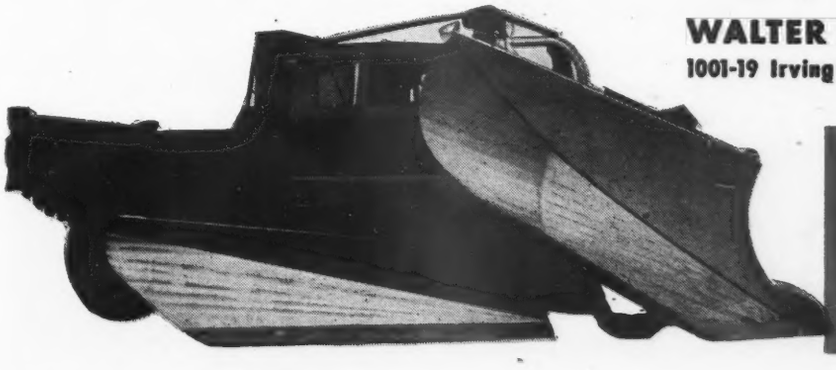


WALTER SNOW FIGHTERS
Clear a 28 ft. Lane at 20-30 m.p.h.

● Put Walter Snow Fighters on the job when snow reaches 2 to 3 inches—and there's no blizzard that can get ahead of them. Shuttling up and down your runways at speeds of 20 to 30 m.p.h., Walter Snow Fighters throw snow far to the side on each run. There are no deep snow banks to be re-handled or to endanger flying. Your runways stay clear throughout the storm for emergency landing—ready for operation the moment visibility returns.

To maintain this necessary high rate of speed requires enormous power and traction—the outstanding characteristic of Walter Snow Fighters. Their exclusive Four Point Positive Drive proportions the power to the FOUR driving wheels according to their traction at any instant. Thus, wheel spinning is eliminated and slipping, stalling and skidding are prevented. This 100% traction in all four wheels enables the driver to maintain a straighter, truer course.

Get the full story of this faster method of runway clearance. Write today for literature describing the many exclusive features of Walter Snow Fighters.



WALTER MOTOR TRUCK COMPANY
1001-19 Irving Avenue, Ridgewood 27, Queens, L. I., N. Y.

WALTER
SNOW FIGHTERS

Passenger 224 Miles a minute

224 passenger miles a minute may seem incredible! But it's only another way of saying that CHICAGO AND SOUTHERN'S new "Skymasters" will transport half a hundred passengers at 4 miles a minute over Gulf-to-Great Lakes sky routes.

Sinclair congratulates CHICAGO AND SOUTHERN on its "Skymaster" project—scheduled flights of Douglas DC-4s designed to make the public's greatest expectations about post-war commercial aviation come true. Luxurious appointments—a powder room for women—private radio receivers built into every seat—and arrangements for television are breath-taking innovations even to the alert air transportation world.

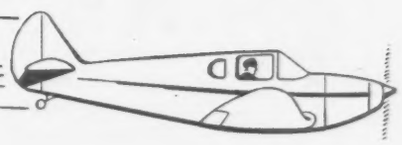
Dependable lubrication has its place, too. CHICAGO AND SOUTHERN uses Sinclair Pennsylvania Aircraft Engine Oil exclusively—has flown its ships more than 19 million revenue miles on Sinclair Pennsylvania.

SINCLAIR AVIATION OILS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.

5 Ways you save by using only the best

GLIDAIR



AK-300 Clear Nitrate Dope

TIME-TESTED

Few, if any, aircraft products demonstrate the economy of quality as conclusively as Glidair AK-300 Clear Nitrate Dope. Here are five important ways you reap immediate and long-run savings by using this superior material:

1 Glidair AK-300, because it is high in "solids", gives faster "build"; *saves two to three coats per job.*

2 "Builds" as fast as a hot dope schedule and yet preserves the tough, flexible quality of cold application.

3 AK-300 flows naturally to a satin-smooth finish, reducing sanding operations to a minimum.

4 Speeds the application of tapes and lays them smoothly, requiring fewer top coats for that mirror finish.

5 The controlled penetration of AK-300 and its carefully adjusted solvents weld successive coats into a single tough sheet forming the ideal foundation for the color coats.

Specify this Time-Tested product of Glidden research next time and see for yourself what a difference it can make. And remember: There's a Glidden finish of similar quality for *every* aircraft need!

THE GLIDDEN COMPANY

Aviation Sales Headquarters • 1833 S. Normal Avenue • Chicago 16, Illinois

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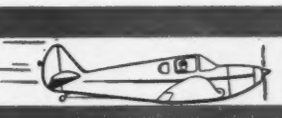


Made by GLIDDEN • Pacemaker in Paints

AN 18 YEAR RECORD OF TOUGH SERVICE!

HOTELS

A GOOD deal of recent discussion seems to indicate that the plastics age is in the future, and of course it is, in the sense that plastics will be much more widely used than they ever have been.

But you should not overlook the fact that at least one plastic material, laminated plastic Formica has been serving since 1927 in some of the hardest architectural surfacing applications, meeting the most brutal wear and abuse and maintaining over the years its original beauty and sparkle.

AIR, BUS, RAIL TERMINALS

In hotels for instance, it has served for years as tops for bedroom furniture defying cigarettes and alcohol; it has been used also in hotels for table tops in restaurants, coffee shops, bars, for elevator interiors, column covering, and wall paneling.

In train, bus, and rail terminals you will find it on main entrance doors—and there are none that get more severe use.

HOSPITALS

It is also applied there to ticket counters, telegraph desks, telephone booths, soda fountains.

In hospitals its stain proof beauty enables it to perform for years without deterioration on bedside and overbed table tops, private room furniture, shelving in the pharmacy—all spots where no ordinary material could stand up.

Restaurants use it for counter tops and panels, cashiers' desks, table tops, window backgrounds, booth partitions and many other uses.

RESTAURANTS

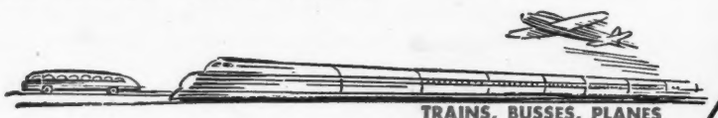
Main entrance doors of theaters, lobby paneling, ticket booths, water fountain back panels, partitions and wall covering in toilet rooms have been equipped with it.

THEATERS

In busses, trains, and planes it is used for window stools, seat backs and ends, table tops, shelving and similar purposes.

In short, wherever exceptional appearance must be combined with unusual resistance to wear there you will find Formica in solid colors, patterns, inlays, and "Realwoods" in which the genuine veneer of rare woods is introduced into the plastic sheet.

For periods up to 18 years Formica has made good in these uses. It is no Johnny-come-lately—but a thoroughly tried, thoroughly tested and well established material. You take no chances when you specify Formica.



TRAINS, BUSSES, PLANES

TOUGH JOBS FORMICA HAS DONE

Entrance Doors Penn Station New York

Table Tops on the Twentieth Century and Broadway Limited Trains.

Furniture, Table Tops, Bars, Bathroom Walls on Queen Mary and Queen Elizabeth.

Wall Paneling of the President's own room at the National Airport, Washington, D. C.

Furniture, Counter tops, Bars, Cocktail room table tops, Washington Statler.

Book Shelves, Desk Panels and Tops, Reading Tables and Tops, Annex to Congressional Library.

Bar Panels and Tops at Lindy's New York Restaurant.

Lobby Paneling and Entrance Doors in scores of Warner Brothers Theaters.

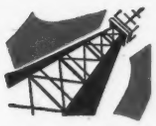
Commissary Paneling Counter Tops and Amphitheater Walls Naval Medical Center, Bethesda, Md.

Elevator Interiors, Municipal Building, Washington, D. C.

Cafeteria Table Tops, Supreme Court Building, Washington, D. C.

These are only a few of the thousands of heavy tasks Formica has been given by top architects and decorators. On its record in service it will get thousands more like them.

THE FORMICA INSULATION COMPANY, 4628 SPRING GROVE AVENUE, CINCINNATI 2, OHIO



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by GENERAL ELECTRIC

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Magnetic-drag Tachometers

For the measurement of aircraft-engine speed, more than half a million tachometer indicators and generators have been supplied to the armed forces alone by General Electric. (Additional thousands were built to G-E drawings by other manufacturers.) Such demand reflects recognition of the following factors:

RELIABILITY—Less than one out of every thousand instruments shipped from the factory has been returned because of malfunctioning.

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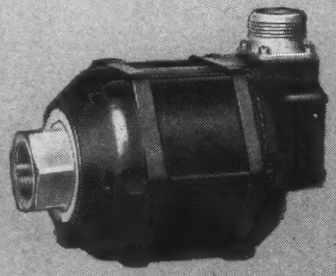
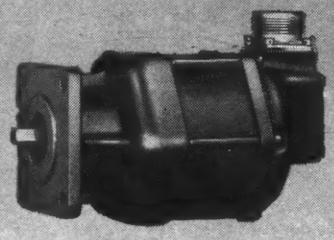


GENERATORS



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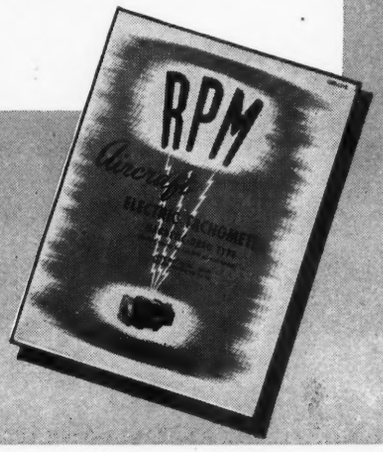
● An explanation of the magnetic-drag principle and its application is contained in Booklet GET-1215. Get your copy from the nearest G-E office or write to: *Apparatus Department, General Electric Co., Schenectady 5, N. Y.*



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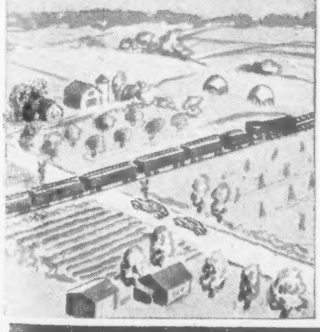

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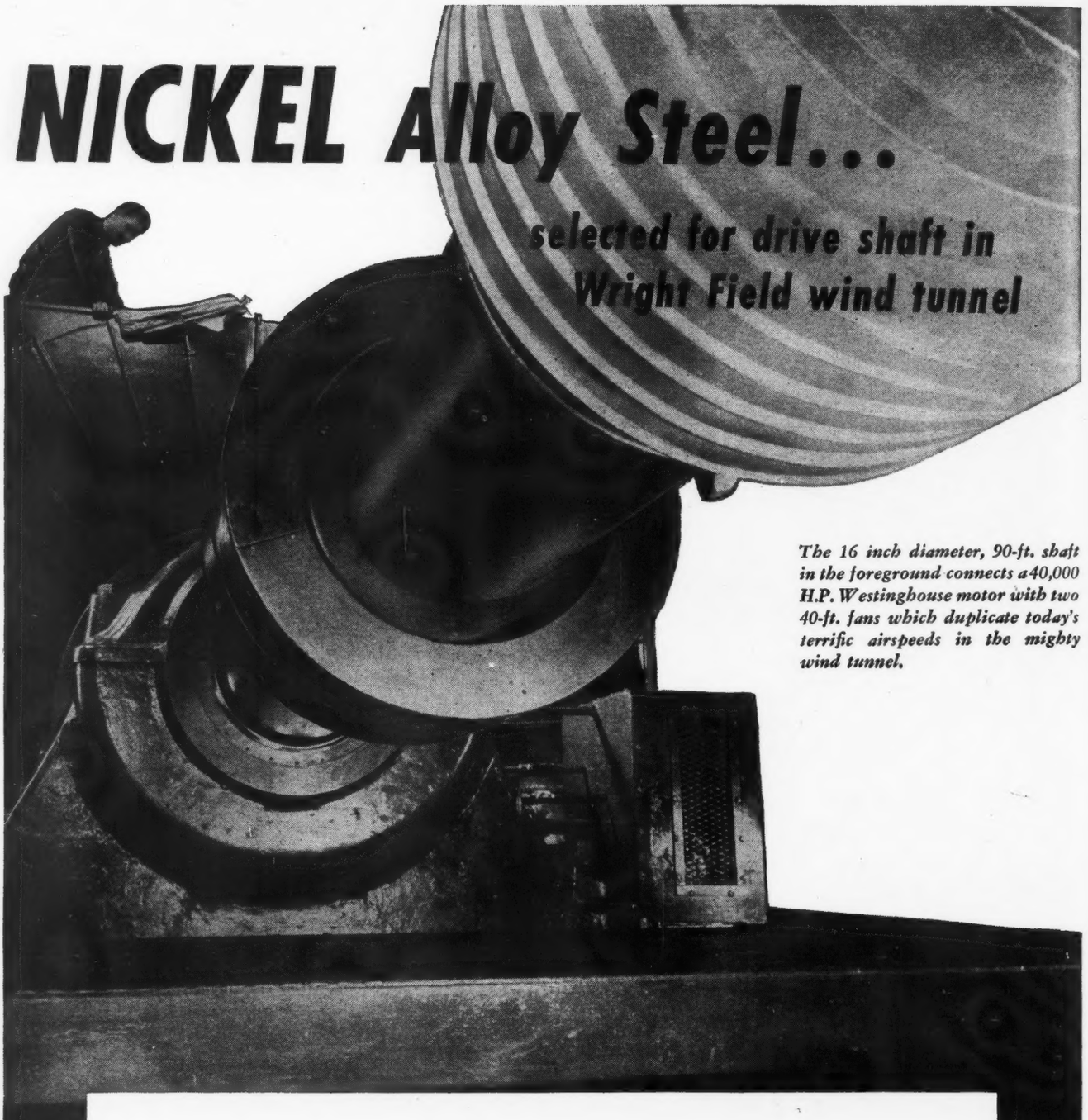
selected for drive shaft in Wright Field wind tunnel



The 16 inch diameter, 90-ft. shaft in the foreground connects a 40,000 H.P. Westinghouse motor with two 40-ft. fans which duplicate today's terrific airspeeds in the mighty wind tunnel.

The high mechanical properties required for this large drive shaft were specified by Westinghouse Electric Co., Inc., suppliers of the wind tunnel motor and auxiliary equipment.

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Yield Point	90,500 p.s.i.
Elongation in 2"	20.0 %
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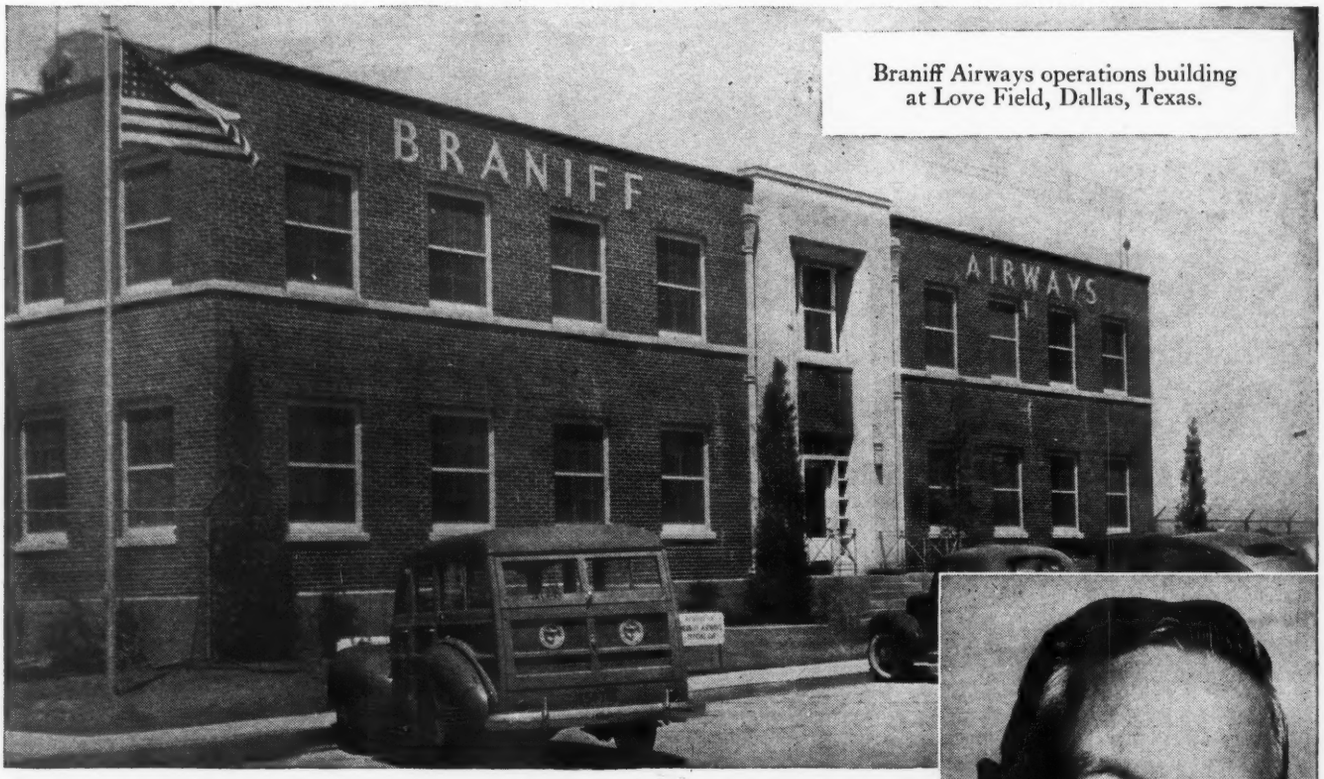

Braniff Airways operations building at Love Field, Dallas, Texas.

People who talk about the pioneer days being over and the lack of new fields for conquest don't know Tom Braniff and the Braniff legend.

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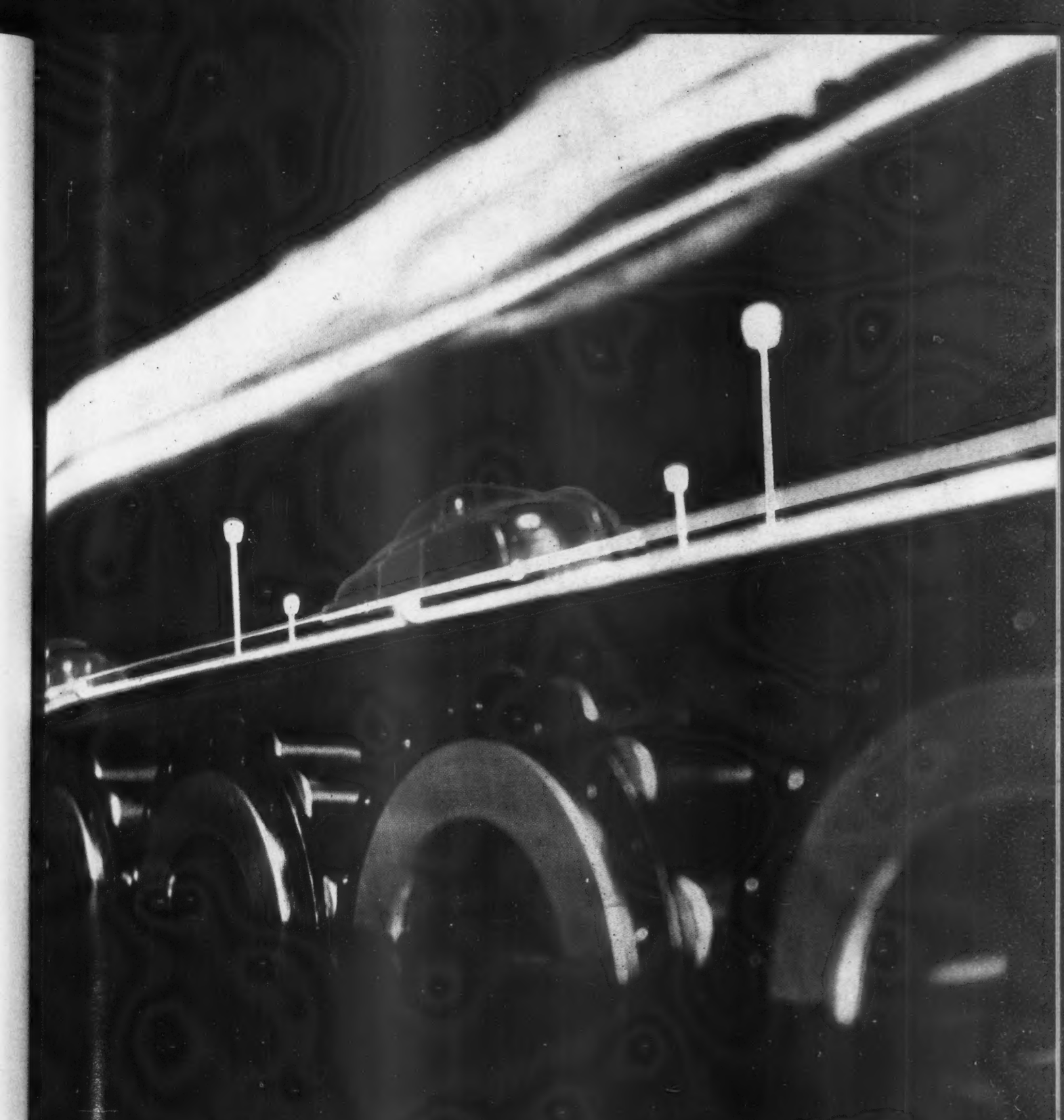

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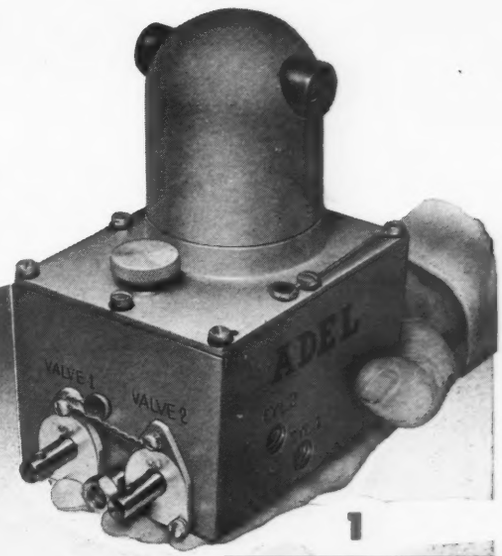

1

ADEL HYDRAULIC DUAL POWER PACKAGE ...heart of the system, it contains, pressurizes, directs and controls the fluid that operates gear and flaps...finger-tip operation of control valves.

2

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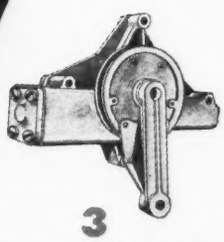

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ADEL Main Landing Gear HYDRAULIC ACTUATORS...provide positive, rotary-type actuating force for full operation of retractable gear...finger-tip control at Dual Power Package...extremely compact for use in shallow airfoil.

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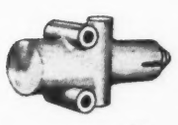
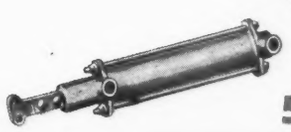


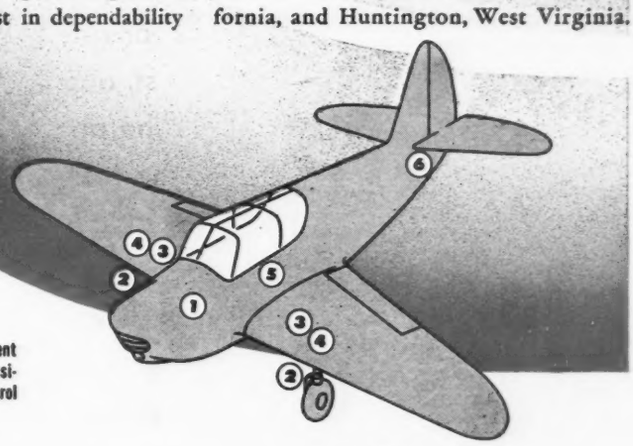
4

ADEL Main Landing Gear HYDRAULIC DOWN-LOCK..fully automatic..completely opens before gear retracts..no possibility of jamming gear..locks if gear is lowered by gravity.



5

ADEL HYDRAULIC FLAP ACTUATOR ...a cylinder with dual fitting for attachment to actuating linkage of each wing flap...positive positioning of flaps by finger-tip control at Dual Power Package.



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ADEL Tail Strut HYDRAULIC SHOCK ABSORBER ...spring and oil combination...light-weight, compact and trouble-free long-life.

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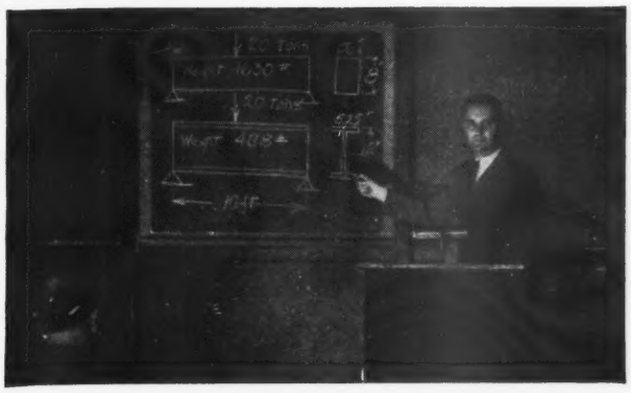

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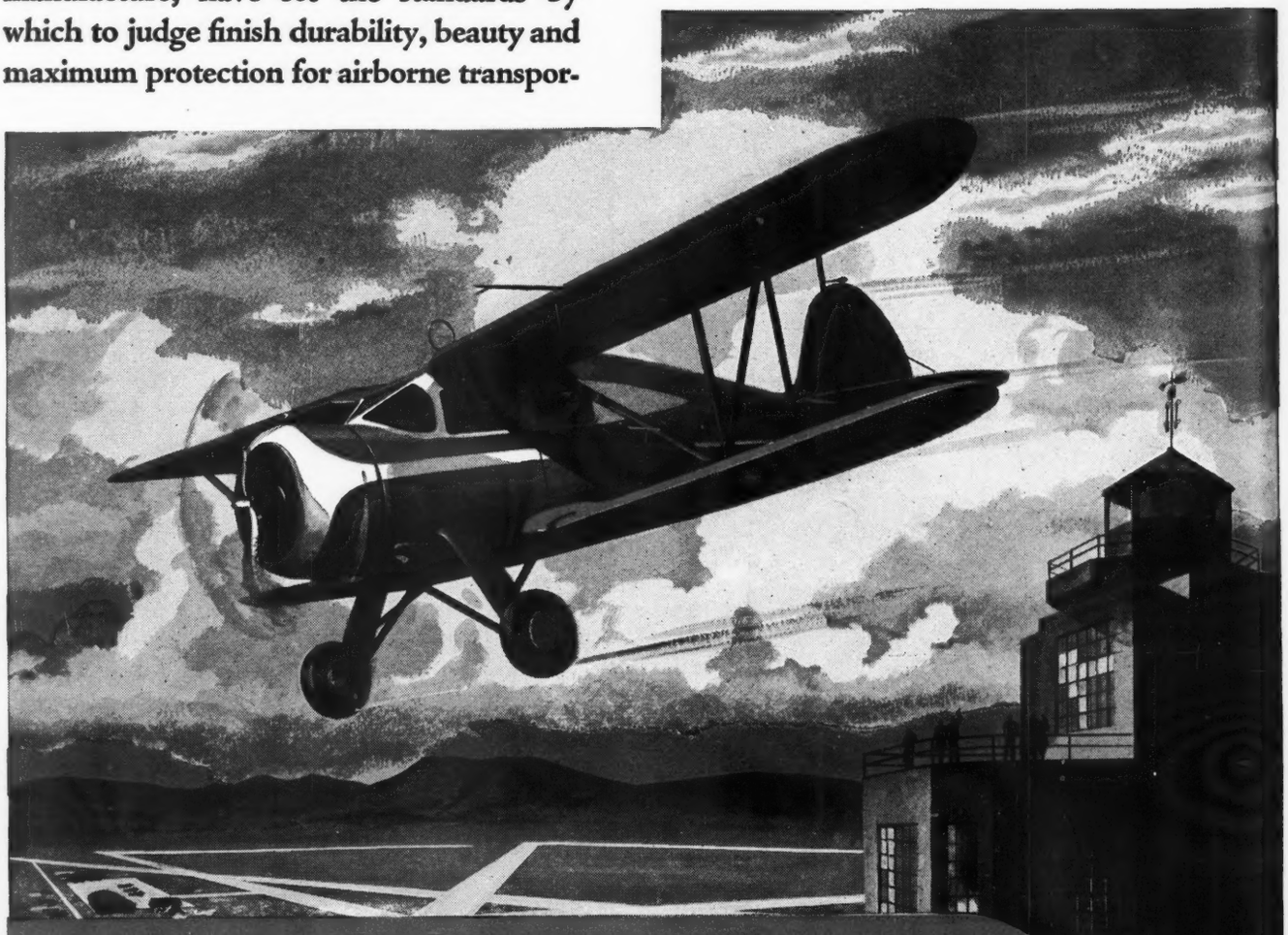

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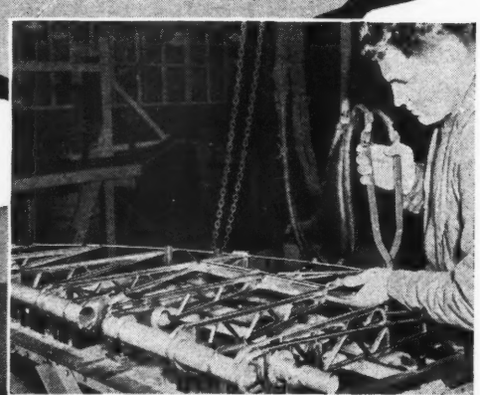

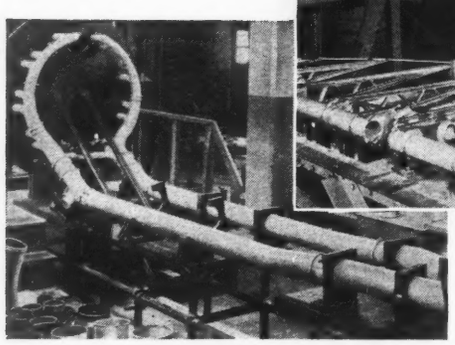

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Exceptionally strong, tough and durable, Stainless Steel also provides greater impact and fatigue strength. It offers superior resistance to corrosion and pitting. Effectively resists abrasion at metal-to-metal contact points.

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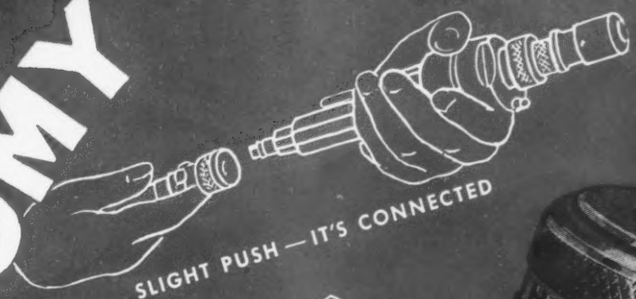

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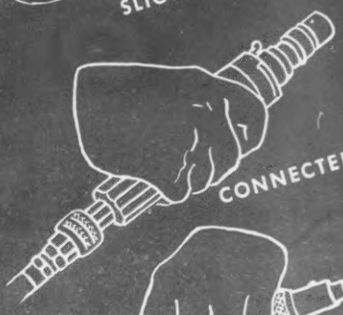

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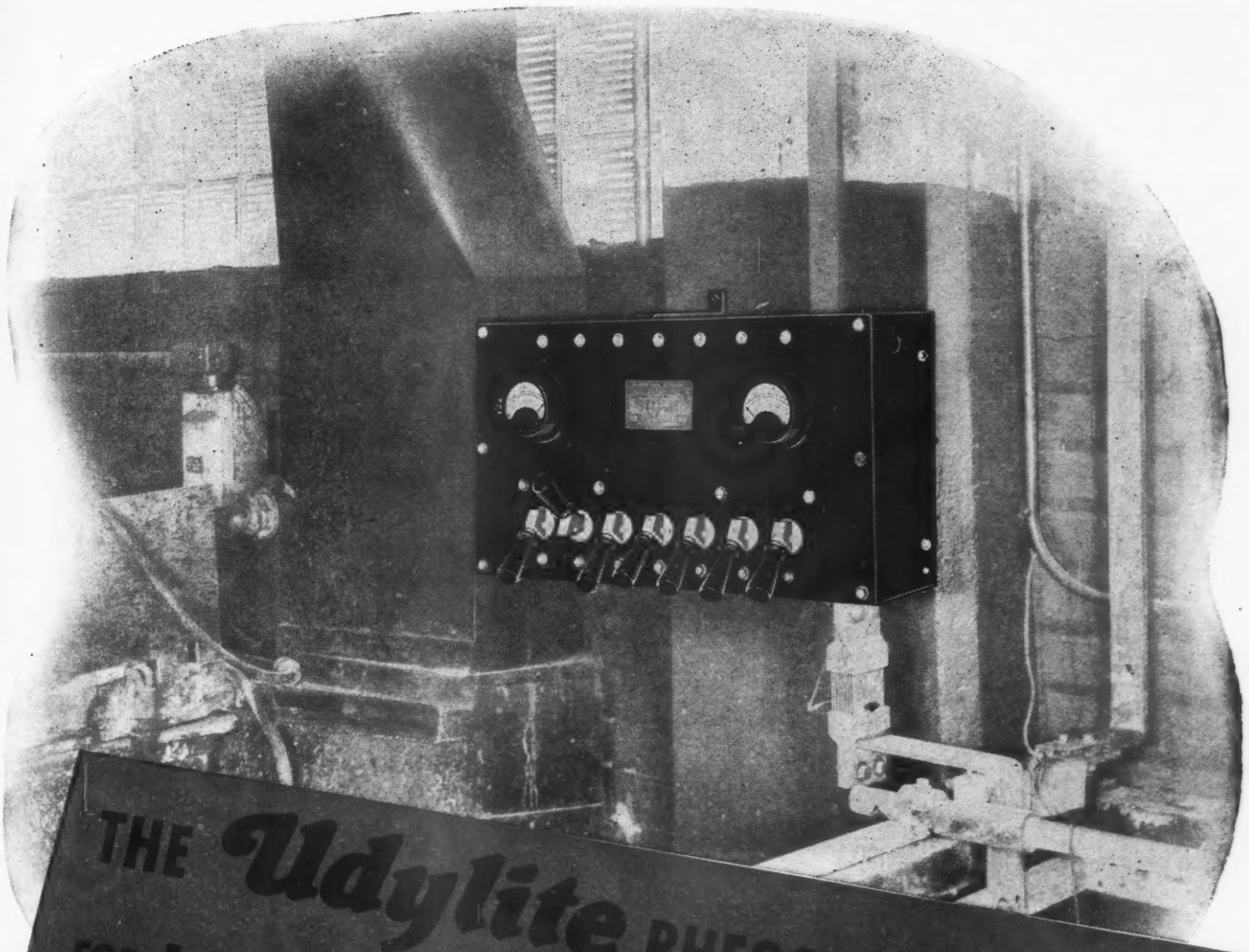

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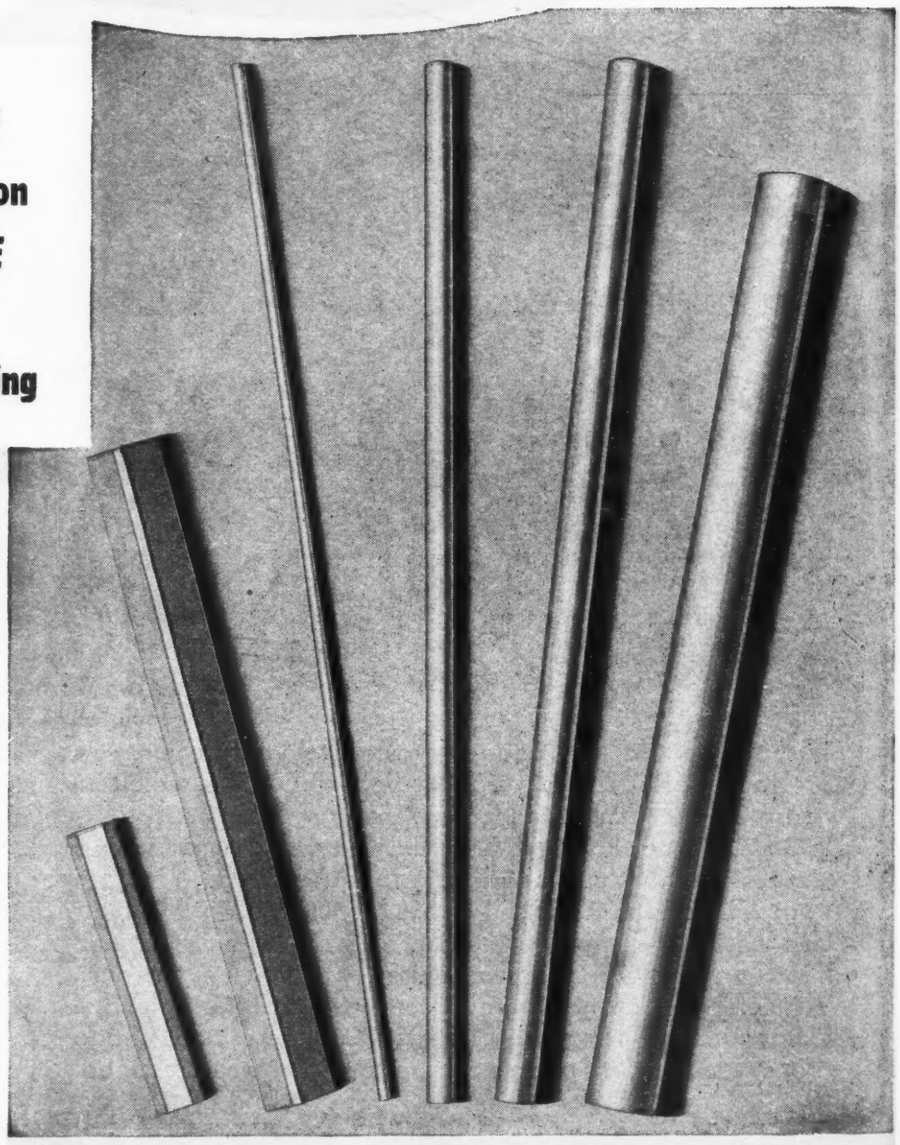
DETROIT 11, MICHIGAN
REPRESENTATIVES IN ALL PRINCIPAL CITIES

AGALOY

Corrosion Resistant

TUBING

You may be sure of proper surface condition *INSIDE* and *OUTSIDE* when you specify AGALOY Stainless Tubing



- **High strength**
- **Heat and corrosion resistant**
- **Fabricates readily**

AGALOY stainless tubing is made in cold drawn welded or seamless construction in sizes to 5/8-inch outside diameter. Write for catalog describing Agaloy's complete line of stainless, carbon and alloy tubing.

MONEL metal 18-8 STAINLESS

AGALOY TUBING COMPANY • MILL: SPRINGFIELD, OHIO

EXECUTIVE AND SALES OFFICES: 1027 NEWARK AVE., ELIZABETH 3, N. J. • CHICAGO OFFICE: 221 NORTH LA SALLE ST., CHICAGO 1, ILLINOIS

This is a reprint of a Thurston advertisement published in 1923 upon the arrival at New York of the Dirigible ZR-1.
The ZR-1 Dirigible in flight over New York yesterday equipped with Gas Cells made of cotton cloth supplied by
W. HARRIS THURSTON & CO., Inc.
We are one of the largest manufacturers of Cotton Aircraft Fabrics in America
Mechanical Cloth Specialists and producers of the finest and lightest cotton cloths
W. HARRIS THURSTON & CO., Inc.
116 FRANKLIN ST., N. Y. CITY

Yesterday and Today it's AIRWING!

On September 11, 1923 the Navy Dirigible ZR-1 sailed across the New York sky equipped with gas cells made of Thurston Cotton Cloth. This event marked a new, revolutionary usage of textiles by the Aviation Industry.

Thurston Fabrics and Tapes have played a major role in the amazing growth of American flying. They distinguished themselves in two World Wars and have proved dependable wherever light weight fabrics of high tensile strength are demanded.

The Airwing line includes airplane and glider fabrics, balloon and special cloths. Airwing Tapes come in a complete selection — Grade A made from long staple Pima cotton, and Lightweight — pinked edge, sealedge, biased, and pre-doped.

REG. U. S. PAT. OFF.

AIR WING FABRICS

ADMA

W. HARRIS THURSTON, INC.
Division of Reeves Brothers, Inc.
40 WORTH ST., NEW YORK 13
Factory and Warehouse
17 BEACH ST., NEW YORK

WRITE US FOR THE NAME OF YOUR NEAREST AIRWING DISTRIBUTOR

Quality Electrical Equipment—
Prompt, Efficient Service—
GET BOTH
Where you see this Emblem

STRATEGICALLY LOCATED throughout the country are 439 Leece-Neville Service Stations, including 52 Central Distributors, all now identified by the emblem shown above. The men operating these stations know from experience that the electrical equipment they sell—built to the high quality standard for which Leece-Neville has been famous since 1910—requires *far less servicing*. But when your Leece-Neville equipment does need attention, you will find that these men know something more: How to recondition it quickly, efficiently, dependably. Look for the emblem identifying the Leece-Neville Service Station nearest you. A complete Service Station Directory is available on request. *The Leece-Neville Co., Cleveland 14, Ohio.*

LEECE-NEVILLE

Pioneer and STILL Quality Leader

GENERATORS • VOLTAGE REGULATORS • SWITCH RELAYS • PUMP MOTORS

Continental-Diamond
Engineered Dielectric Materials
for a Better
TOMORROW ★

Illustrated is a DILECTO fabric base laminated phenolic part used in airborne electrical equipment. Since this part is subject to severe mechanical stresses and is also an insulator it must be strong and remain stable under vibration, high humidity and temperature extremes. DILECTO meets all these requirements, with a wide margin of safety.

C-D Dielectric materials are engineered to meet specific electrical and mechanical problems. There are standard grades developed as a result of experience gained during 50 years of serving manufacturers in every industry. These standard grades can, however, be modified to meet particular problems. Combinations of the different C-D NON-metallic materials can also be made to provide required combinations of properties. C-D technicians will be glad to study your "What Material" problems and suggest solutions.

KL-45

C-D PRODUCTS

The Plastics

DILECTO—A Laminated Phenolic.
CELORON—A Molded Phenolic.
DILECTENE—A Pure Resin Plastic Especially Suited to U-H-F Insulation.
HAVEG—Plastic Chemical Equipment, Pipe, Valves and Fittings.

The NON-Metallics

DIAMOND Vulcanized FIBRE
VULCOID—Resin Impregnated Vulcanized Fibre.
MICABOND—Built-Up Mica Electrical Insulation.

Standard and Special Forms

Available in Standard Sheets, Rods and Tubes; and Parts Fabricated, Formed or Molded to Specifications.

Descriptive Literature

Bulletin GF gives Comprehensive Data on all C-D Products. Individual Catalogs are also Available.

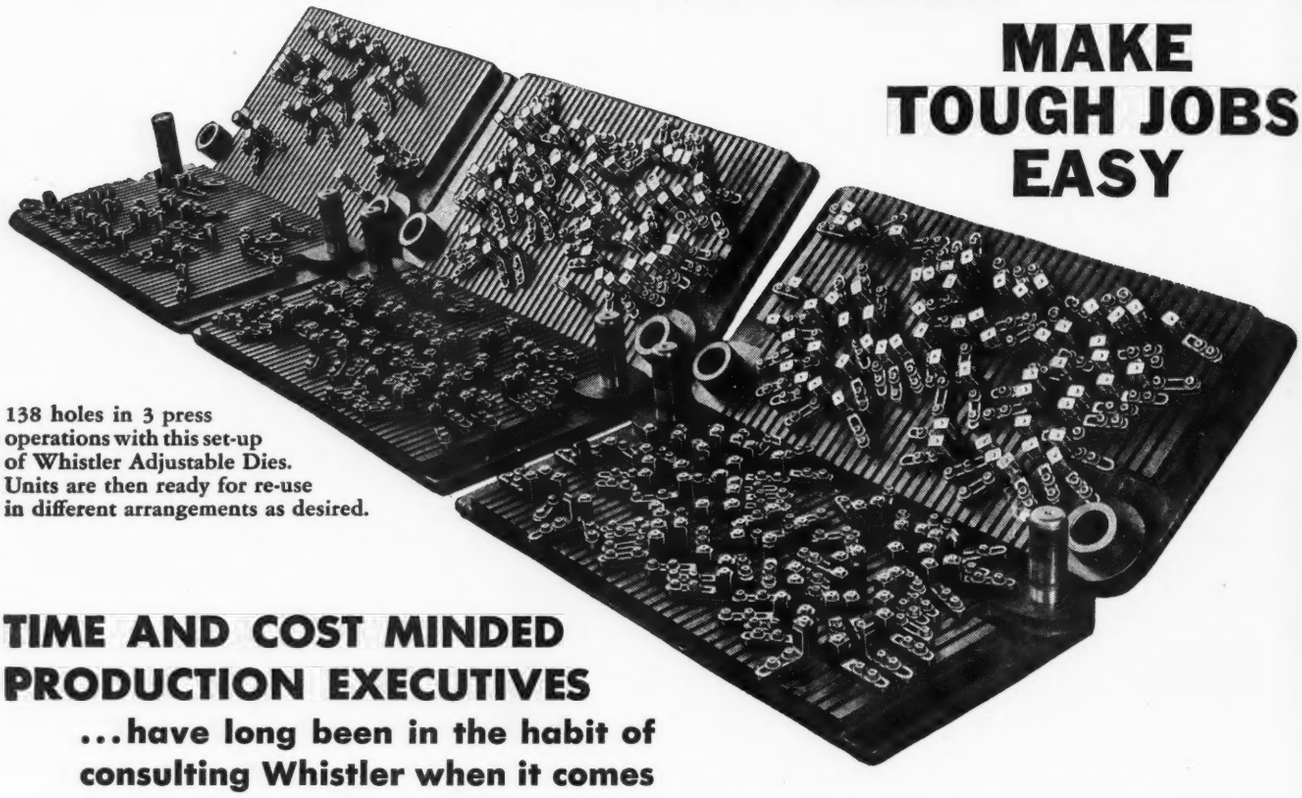
DISTRICT OFFICES
NEW YORK 17 • CLEVELAND 14 • CHICAGO 11
SPARTANBURG, S. C. • SALES OFFICES IN PRINCIPAL CITIES
•
WEST COAST REPRESENTATIVES
MARWOOD LTD., SAN FRANCISCO 3
•
IN CANADA:
DIAMOND STATE FIBRE CO. OF CANADA, LTD., TORONTO 8

Continental-Diamond FIBRE COMPANY

Established 1895.. Manufacturers of Laminated Plastics since 1911— NEWARK 77 • DELAWARE

WHISTLER PERFORATING—NOTCHING SLOTTING—ROUNDING DIES

MAKE TOUGH JOBS EASY



138 holes in 3 press operations with this set-up of Whistler Adjustable Dies. Units are then ready for re-use in different arrangements as desired.

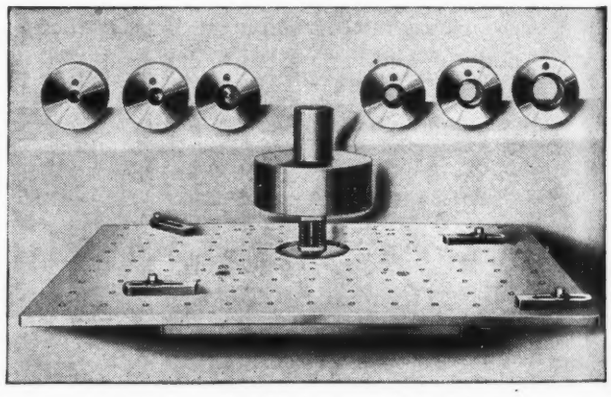
TIME AND COST MINDED PRODUCTION EXECUTIVES

...have long been in the habit of consulting Whistler when it comes to dies for work on sheet metals.

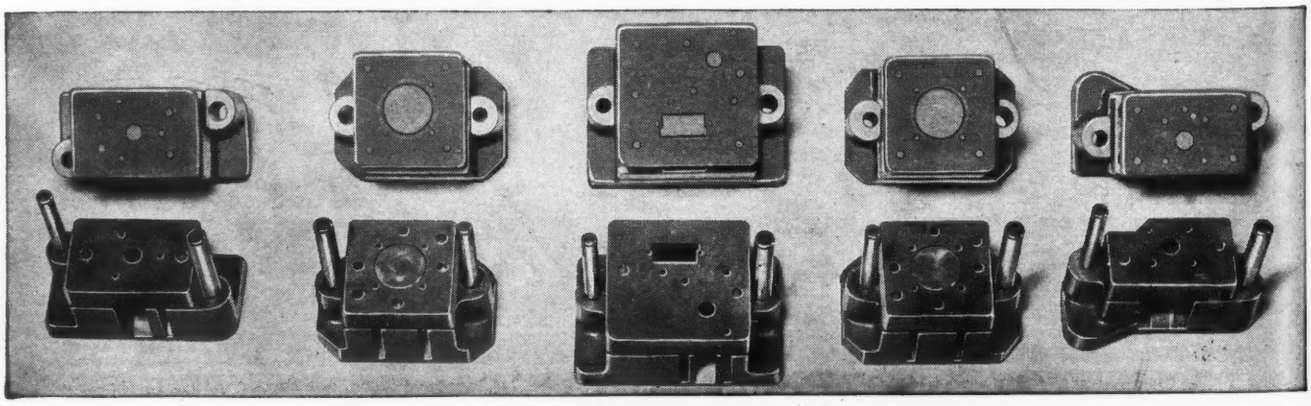
A leading Whistler achievement in reducing die-making and production costs is the multi-use Adjustable Perforating Dies which enable most set-ups to be made from stock units. The Single Hole Perforator, another Whistler development, presents new advantages in quick changes and a wide range of hole sizes. In fact Whistler adjustable dies, group dies, and single purpose dies have contributed greatly to the production achievements of the nation's leaders in practically every line of manufacture. Write for the Whistler catalogs and get the entire story of how to reduce manufacturing costs and get into production faster.

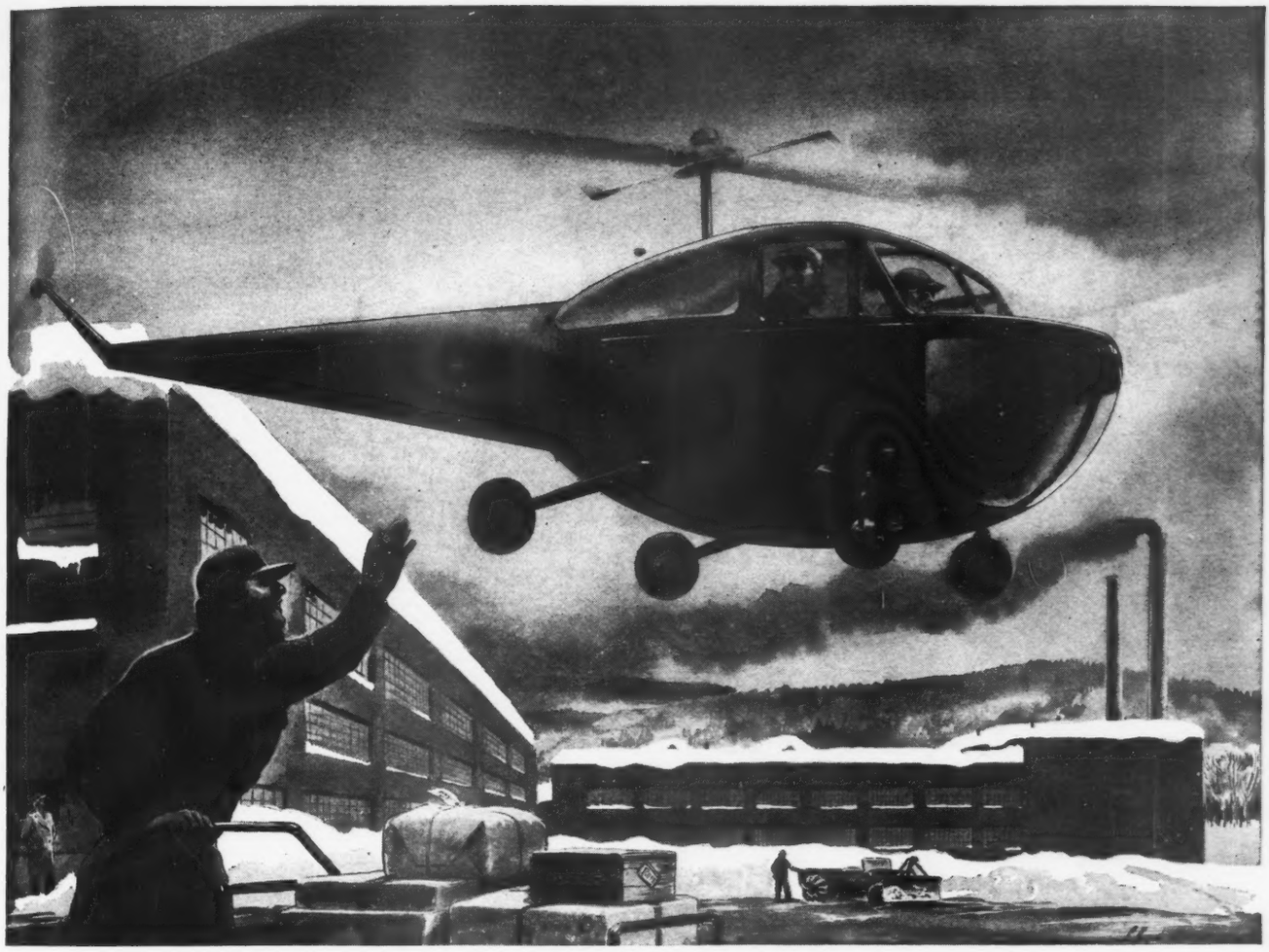
S. B. WHISTLER & SON, INC.
752-756 MILITARY ROAD, BUFFALO 17, NEW YORK

Illustrated below, ready for production, is the Whistler Single Hole Perforator set with punch and die adaptor rings for perforating 1/32" to 1 1/2" in mild steel to and including 1/4" thickness when used with Whistler Punches, dies and strippers.



Group dies and special shapes to order. Often used on the press in combination set-ups with Whistler Adjustable Dies.





Point to Point Delivery by "The Modern Magic Carpet"*

BELL Helicopters will offer business and the public point to point delivery of people, merchandise and materials. For this versatile form of air transportation is a "Modern Magic Carpet." Helicopters can take off vertically from a small space...fly slowly or swiftly...sideways or backward...hover over and land on practically any spot where there is sufficient room for the clearance of the rotors.

As a result Bell Helicopters will need no elaborate, expensive terminal facilities. Business and Industry will be able to make aerial pick ups and deliveries of people, mail, supplies and merchandise from source to destination.

Bell Aircraft is concentrating its engineering skill and advanced thinking on designing and building helicopters capable of performing many practical commercial, industrial and military operations for which the helicopter is more fitted than the conventional airplane or other means of transportation.

Helicopters are destined to become a more common method of travel. When they do, look to Bell Aircraft to build helicopters which uphold the traditional reputation of being the "Pacemaker of Aviation Progress"

**Reg. applied for U.S. and principal foreign countries.*

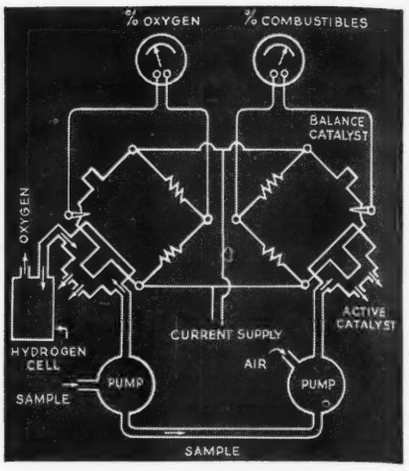
BELL *Aircraft* **CORPORATION**

Buffalo 5, New York

© *Bell Aircraft Corporation*

PACEMAKER OF AVIATION PROGRESS

How To Improve Engine Operating Efficiency, Reduce Fuel Consumption



The Aviation type Power Prover indicates two components in the products of combustion, namely, combustibles and oxygen. It covers any range of mixtures from the leanest to richest that the fuel will burn. The indicated readings are obtained directly from the oxygen and combustible contents of the gases under test, through the catalytic combustion method.

Those engaged in the operation of airplanes will agree that the right place to test the plane and its component parts is in the air.

Unfortunately, previous methods of engine flight tests have been slow and expensive. This has led to no flight testing at all or compromises between a large number of ground tests and a few flight tests. Assumptions, which are a possible cause of error and differences of opinion, have been made.

Actual Flying Conditions

Frequently, even if flight testing is carried out, it is done to suit local conditions and availability of personnel and equipment, which in the long run does not give the results expected. To eliminate all variables and unknowns, tests should be made under conditions similar to scheduled flying.

This requires either a special plane and test crew operating over a wide area or tests made during routine flights. The former procedure involves an expense not always justified by results. The latter necessitates light, compact, easily operated test equipment.

Portable Power Provers are used in test laboratories for developing new engines and engine accessories, and in the air for flight-testing up to high altitudes.

Test Equipment Available

The Cities Service Oil Company is now making available to airplane operators flight test equipment that meets these requirements, the *patented, portable* FLIGHT TEST POWER PROVER. This unique instrument is used for tests relating to the burning of all types of fuel and serves as a guide to reduced fuel expense and better operating conditions.

Power Prover flight tests reveal engine characteristics for such items as continuous indication of fuel-air mixtures, products of combustion, distribution of fuel among the cylinders or burner units, efficiency of fuel-injection methods, lean mixture effects, altitude and temperature effects, fuel and air mixture equipment characteristics, water injection effects on combustion and crankcase atmosphere conditions.

How To Arrange For Tests

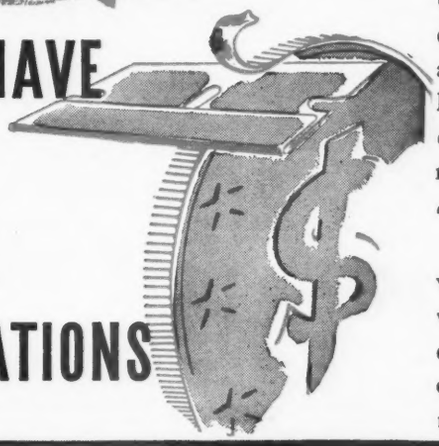
If any of these subjects are of interest in connection with your particular method of operation, Cities Service Oil Company aviation engineers will be pleased to discuss them with you. Address 60 Wall Tower, New York 5, N. Y.

CITIES SERVICE OILS
ONCE-ALWAYS

FOR EVERY LUBRICATION PROBLEM
CALL Cities Service FIRST!

Perhaps

YOU COULD SHAVE A LITTLE COST FROM A LOT OF OPERATIONS



ON EVERY JOB where a hand tool is used, there is often an opportunity to cut costs, improve workmanship, promote safety. *On any job* an obsolete or ill-adapted tool is a stubborn slow-downer, a day-after-day waster of time, skill, energy. In the manufacture and maintenance of aircraft there are hundreds of operations where hand tools are directly affecting workers' efficiency. That is why a methodical replacement of misfit tools with *the right Snap-on for each operation* can contribute significantly to lower costs.

Snap-on's nation-wide tool service is conveniently available through 38 factory branch warehouses in principal industrial centers. Send coupon below for catalog of 3,000 modern Snap-on tools, and check if you wish a Snap-on representative to call.

Snap-on Tools

THE CHOICE OF BETTER MECHANICS

SNAP-ON TOOLS CORPORATION
8020-B 28th Avenue, Kenosha, Wisconsin

.....Send me the Snap-on catalog.

.....Have a Snap-on representative call.

Name.....

Company.....

Address.....

.....

SNAP-ON TOOLS CORPORATION 8020-B 28th Avenue KENOSHA, WISCONSIN

AIRCO NO. 26
DRAWN SILICON-ALUMINUM ROD
Made of 5% silicon and 95% aluminum, for welding aluminum and silicon-aluminum alloy products. It is particularly adaptable for welding aluminum regardless of composition where parts are held tightly in jigs. Available in 1/16", 3/32", 1/8", 3/16", and 1/4" sizes — 36" lengths.

AIRCO NO. 25
DRAWN ALUMINUM ROD
Ideal for welding sheets of the common aluminum alloy compositions. Made in 1/16", 3/32", 1/8", 3/16", and 1/4" sizes — 36" lengths.

AIRCO NO. 4
HIGH TENSILE STEEL ROD
A high test rod that produces welds of high physical properties. Available in 1/16", 3/32", 1/8", 3/16", and 1/4" sizes — 36" lengths.

WELDERS do find these three rods easier to work. Their smooth flowing qualities, uniformity and ductility enable them to do a better job . . . faster — every time.

This is true of any Airco rod, flux or other supply item. In fact, for more than a quarter century, welding operators and burners have found Airco products to be "tops in the field" for all oxyacetylene welding and cutting jobs.

And Airco's offices — conveniently located in all principal industrial centers—can make delivery from stock. Call your nearby Airco office today.

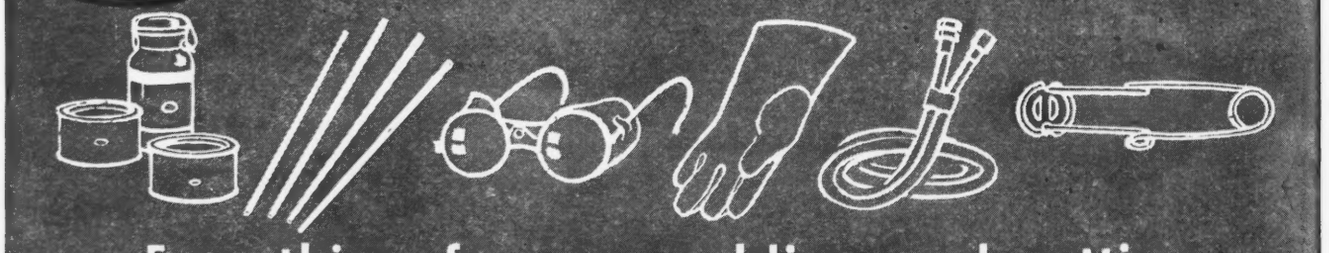
Save Buying Time—

Send for your FREE copy of Catalog No. 40. It gives further details on Airco's comprehensive line of gas welding supplies. Address your nearest office or write to Dept. A at the New York office.

AIR REDUCTION

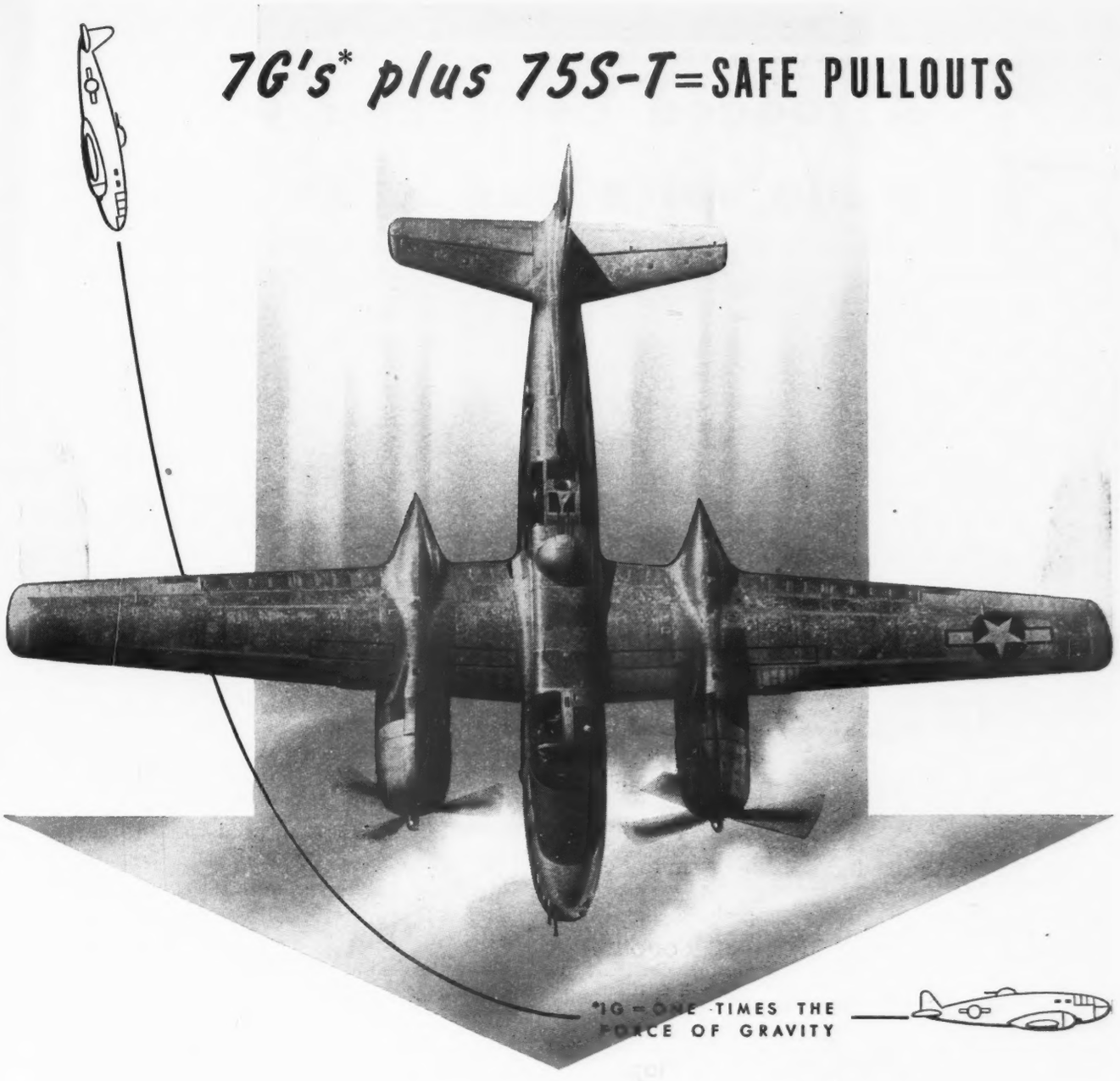
General Offices: 60 EAST 42nd STREET, NEW YORK 17, N. Y.
In Texas: MAGNOLIA AIRCO GAS PRODUCTS CO. • General Offices: HOUSTON 1, TEXAS
Offices in All Principal Cities
Represented Internationally by Airco Export Corporation

AIRCO



Everything for gas welding and cutting

7G's* plus 75S-T=SAFE PULLOUTS



Pull-outs of 7G's impose terrific strains on wings.

In Douglas A26 Invaders, with wing spar caps of Alcoa 75S-T stepped extrusions, the safety factor was well in hand. This amazingly high-strength aluminum alloy, increased static test results to 115% of rated load . . . without a weight penalty.

This is just one of the many airplane applications for Alcoa Alloy 75S-T, where highest strength with accompanying light weight are major design factors. For information on the amazing characteristics of this alloy and where it can be effectively employed in your airplane, write ALUMINUM COMPANY OF AMERICA, 2182 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN **ALUMINUM**

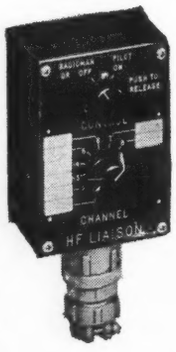
ALCOA ALUMINUM

A rugged performer with a big voice and keen ear!

Collins AN/ARC-2 Autotune transmitter-receiver

The AN/ARC-2 Autotune transmitter-receiver was designed and is built by Collins for two place and larger military aircraft. It is an example of the experience, design ingenuity and manufacturing skill also available, in the Collins organization, to commercial users of communication equipment.

Remote Control Box



Transmitter, receiver and dynamotor are all contained in the same case. The weight and space requirement of the AN/ARC-2 is considerably less than that of the equipment it replaces. Any one of eight pretuned channels is immediately and automatically available by means of the Collins Autotune, operated either at the main panel or by remote control. The transmitter and receiver operate on the same frequency and are tuned simultaneously by a single set of controls.

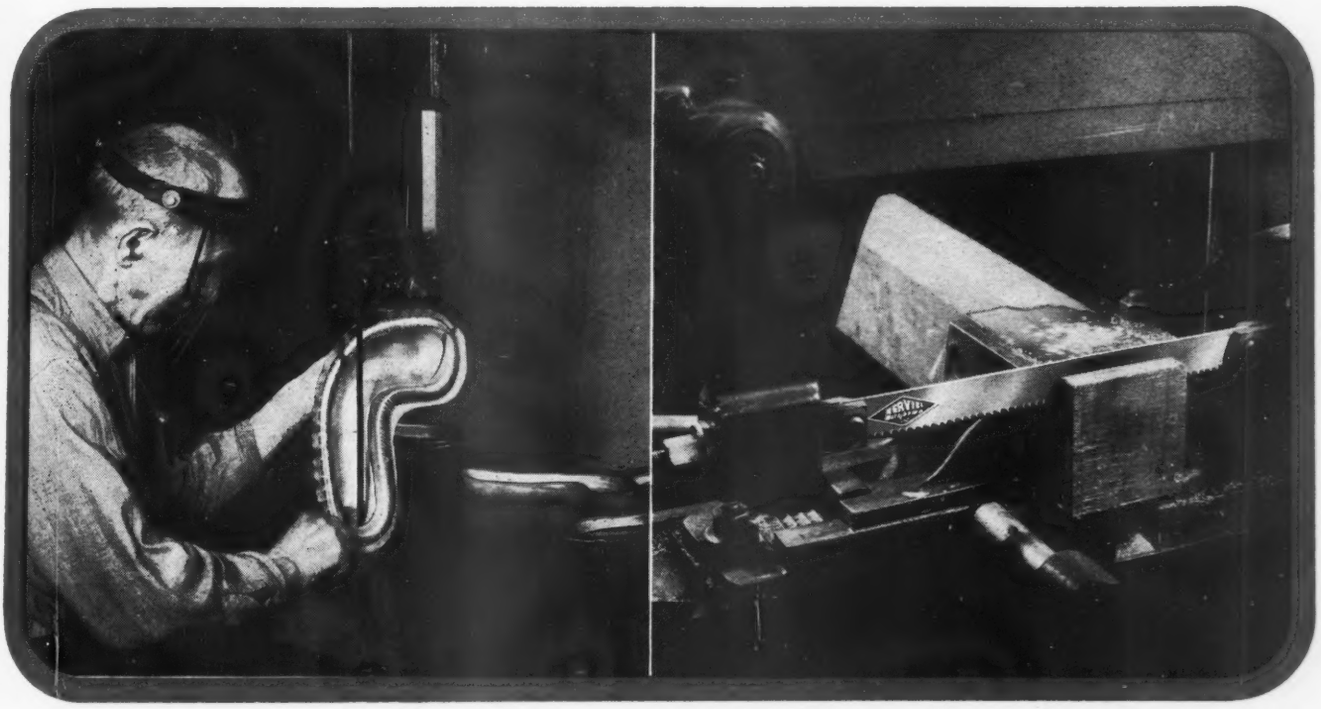
This equipment, including its Autotune mechanism, functions reliably at all temperatures from −58° to +140° F, all altitudes from sea level to 40,000 feet, and all conditions of humidity up to saturation.

The Collins organization specializes in fulfilling exacting requirements. We will welcome an opportunity to make recommendations regarding your needs in the field of radio communication equipment.
Collins Radio Company, Cedar Rapids, Iowa;
11 West 42nd Street, New York 18, N. Y.

IN RADIO COMMUNICATIONS, IT'S . . .

COLLINS

For Top Efficiency in Your METAL CUTTING PRODUCTION



CHOOSE *The Faster Cutting, Longer Lasting* BARNES HACK SAW BLADES and metal cutting BAND SAWS

THE experience gained through over a quarter of a century spent solely in the manufacture of quality metal cutting saws produces today's *better* Barnes Blades. Through actual use on sawing production in the nation's leading plants, Barnes Band Saws and Hack Saw Blades have proved their superior cutting performance, their ability to give faster, smooth-cutting, trouble-free service over a greatly longer service life.

For the band saws or hack saw blades best suited to your particular metal cutting requirements, call your Barnes Distributor. He carries a complete line in stock. Barnes Factory-Trained Service Engineers are available to help you on your special sawing problems.

BARNES BAND SAWS:
Arc-Line (for contour cutting), Hard Edge Flexible Back, Skip Tooth, Spring Temper.

BARNES HACK SAW BLADES:
(Power) Red Arrow, Service. (Hand) Red Arrow, Special Unbreakable, All Hard, Standard Flexible, "600".

ESTABLISHED 1919

W. O. BARNES CO., INC.

DETROIT 14, MICHIGAN

WHAT
WE HAVE DONE
FOR OTHERS
WE CAN DO
FOR YOU
THE
TELEOPTIC
COMPANY
Racine, Wisconsin
WRITE FOR DETAILED LITERATURE ON
PRECISION PARTS, ASSEMBLIES, AND TIMING MECHANISMS
THE TELEOPTIC COMPANY, 1253 Mound Ave., Racine, Wisconsin

When History Repeats Itself....

Marco Polo won't need a camel • • he'll *FLY* for Kublai Khan

That doughty Venetian, Marco Polo—a man of the world if ever there was one—traveled a big sales territory for Emperor Kublai Khan back in 1280. From Sinkiang and Burma to Japan, from Upper Mongolia to Java, he peddled his wares, and it took him years on a single trip. Today, with a trim plane like the Waco VKS-7F, he'd be back at Kublai's court with a briefcase full of orders in a matter of days.

PHOTO COURTESY OF WACO AIRCRAFT COMPANY

New speed records in sales and distribution are constantly being made, only to be broken, thanks to air travel. And with every type of U. S.-built plane, from flying grasshoppers to huge overseas transports, OSTUCO's Seamless Steel Tubing is contributing structural strength-weight advantages to the speed, economy and safety of flight. The Ohio Seamless Tube Company, one of the nation's oldest producers of steel tubing, promises to continue to keep pace with aircraft progress through experienced craftsmanship, on-time deliveries and the "low-reject" record that have made OSTUCO famous.

THE OHIO SEAMLESS TUBE COMPANY

OSTUCO — SHELBY, OHIO

BRANCHES: 20 N. Wacker Drive, Chicago; 1328 Citizens' Bldg., Cleveland; 2857 E. Grand Blvd., Detroit; 927a M&M Bldg., Houston; 170 S. Beverly Drive, Beverly Hills (Los Angeles); 225 5th Ave. Bldg., Moline; 3735 St. James St., Montreal; 70 E. 45th St., New York; 123 S. Broad St., Philadelphia; 1230 N. Main St., St. Louis; 1911 Smith Tower, Seattle; 501 Roberts Ave., Syracuse; 604 Tulsa Loan Bldg., Tulsa; 1016 Mainland St., Vancouver.

Plant and Main Office
SHELBY, OHIO

MANUFACTURERS OF SEAMLESS AND ELECTRIC-WELD STEEL TUBING

DESIGNER: To whom, please, are you referring?

NILMERG: His name is COMPETITION.

DESIGNER: Oh, him—

NILMERG: He sort of took a back seat during the War, but you'll see him around a lot now.

DESIGNER: I begin to get your drift. In order to make progress with COMPETITION I must create. If I don't create I don't eat.

NILMERG: True and sagely stated. The best aid to a creative craftsman is A. W. Faber's WINNER Techno-TONE Drawing pencil with its satin-smooth graphite and scientific grading in 17 uniform tones of black.

DESIGNER: WINNER Techno-TONE will help me create?

NILMERG: Brother, when you are pursuing an elusive idea—a WINNER Techno-TONE Drawing pencil in your fingers is like holding a comet by the tail. It records your brain impulses with graphic brilliance. You can imagine it would *have to be good* to carry the trademark of the House of A. W. FABER-CASTELL with its generations of prestige.

DESIGNER: This paragon of a pencil costs a great deal more than run-of-the-mine pencils?

NILMERG: Just a few pennies more, but what real craftsman would let that trifle stop him?

DESIGNER: You don't have to sell me on an A. W. Faber product. My grandfather used A. W. Faber pencils.

NILMERG: And his grandfather before him and his grandfather way back for 185 years!

THE HOUSE OF AW FABER "CASTELL" STANDARD OF THE WORLD

A.W. FABER WINNER Techno-TONE MADE IN U.S.A. 2H

WINNER
Techno-TONE
DRAWING PENCIL

A PRODUCT OF THE HOUSE OF AW FABER CASTELL
NEWARK 4, NEW JERSEY

Lockheed "leadership" *includes* AEROLS!

Renowned for speed, size and safety, the "Constellation" typifies the famed slogan, "Look to Lockheed for Leadership." Quality and reliability distinguish every component of the "Constellation"—explaining why this outstanding transport plane is equipped with Aerol landing gear.

America's biggest planes are equipped with Aerols to cushion landing shock and protect plane, crew and cargo. Introduced when aviation was still in its infancy, Aerols are contributing substantially to aviation's progress—as planes grow in size, weight and speed, Aerols solve their landing problems.

THE CLEVELAND PNEUMATIC TOOL CO.
AIRCRAFT DIVISION • CLEVELAND 5, OHIO

Look inside the tough synthetic rubber sheath of this superior cable. You will find an impregnated inner braid of glass-yarn. And there you have the reason for its greater mechanical strength and exceptional resistance to corona. Proved under extreme combat conditions, Packard high-altitude aircraft ignition cable will withstand heat, cold, oil and moisture to a far more adverse degree than you may expect to encounter. Available with either a steel or a copper conductor, it is RIGHT for *any* aircraft need.

Packard
REG. U. S. PAT. OFF.
TRADE MARK

Packard Electric Division, General Motors Corporation, Warren, Ohio

the
RED
ELASTIC
COLLAR
protects
permanently
the RED ELASTIC COLLAR — denoting an ESNA product — is . . .
. . . permanently clinched to prevent turning under application and subsequent operational stresses.
. . . permanently secure against vibration effects. The bolt impresses (does not cut) full contact threads.
. . . permanently tight against moisture. Bolt threads have 100% contact in collar, and are fully seated in metal.
. . . permanently elastic. The Red Collar retains its grip after repeated usage.

What happens when this Red Elastic Collar becomes part of a nut? The nut becomes an ESNA Elastic Stop Nut! And it provides permanent protection for any detachable or adjustable assembly.

How?

First, an Elastic Stop Nut *locks in position anywhere on a bolt or stud.* Every bolt can be precisely prestressed to carry its full load. Positioning devices can be adjusted with precision. Vibration cannot disturb these settings — because the Red Elastic Collar eliminates all play between bolt and nut threads with its full contact, permanent grip.

Second, it *prevents thread corrosion.* Moisture is sealed out. Adjustment or removal is easy — any time.

Third, it *prevents thread damage.* Full thread contact in the Red Elastic Collar keeps the metal threads firmly seated. Axial play caused by vibration or stress reversal is dampened.

Fourth, it *prevents seepage of liquids past bolt threads.* Permits nut to be used as a sealing device.

Fifth, it *prevents maintenance waste.* The Red Elastic Collar, which does not injure the bolt or its plating, permits repeated usage.

Here's a challenge: Send us complete details of your toughest bolted trouble spot. We'll supply test nuts — FREE, in experimental quantities. Or, if you want further information write for literature. Elastic Stop Nut Corporation of America, Union, New Jersey. Representatives and Agents in principal cities.

ESNA

ELASTIC STOP NUTS

INTERNAL WRENCHING · ANCHOR · INSTRUMENT MOUNTING · SPLINE · CLINCH · GANG CHANNEL · CAP

PRODUCTS OF: ELASTIC STOP NUT CORPORATION OF AMERICA

TEMPERATURE EQUALIZATION at EVERY altitude...

ANEMOSTAT air-diffusers maintained the uniform temperatures required throughout the interior of this N.A.T.S. Skymaster that carried men and supplies to the armed forces in all the war theatres.

...through ANEMOSTAT air-diffusers

The equalization of temperature in aircraft passenger cabins and cargo spaces is complicated by the decreasing density of air as higher altitudes are encountered. This factor, added to the usual drafts occurring in cabins without effective air-distribution, further aggravates the problem of uniform heating and ventilating.

These air-diffusion problems can be solved for every type of plane by the use of ANEMOSTAT air-diffusers. This is proved by the performance of ANEMOSTATS engineered to meet the special — and often extreme — requirements of thousands of Army, Navy and commercial airline planes.

HOW ANEMOSTATS DISTRIBUTE CABIN-AIR

Due to its patented design, the ANEMOSTAT distributes air of any duct velocity in a multiplicity of planes traveling in all directions. Simultaneously, it creates a series of counter-currents which siphon *into the device* cabin-air equal to about 35% of the supply air, and mixes the cabin-air within the device with the supply air before it is discharged. The ANEMOSTAT effects air-expansion within the device, which instantly reduces velocity. Therefore, the ANEMOSTAT diffuses air of any duct velocity *noiselessly and evenly, thoroughly and draftlessly* throughout the cabin . . . closely equalizes temperature and humidity . . . and prevents temperature stratification.

ANEMOSTATS TAILOR-MADE FOR EVERY PLANE

A great variety of air-diffusion patterns are necessary to meet the needs of cargo spaces, passenger quarters, and flight decks in the varied and ever-changing aircraft designs. But, regardless of plane design, ANEMOSTATS — tailor-made to meet individual requirements — deliver *draftless* heating and ventilating . . . at any altitude . . . under all flying conditions. If you want to know *how* ANEMOSTAT air-diffusers overcome these problems, **write today for details** — there's no obligation.

Veteran-ize your personnel!
Many discharged war veterans received valuable technical and specialized training. Always consider veterans when you employ. They did their share —now let's all do ours!

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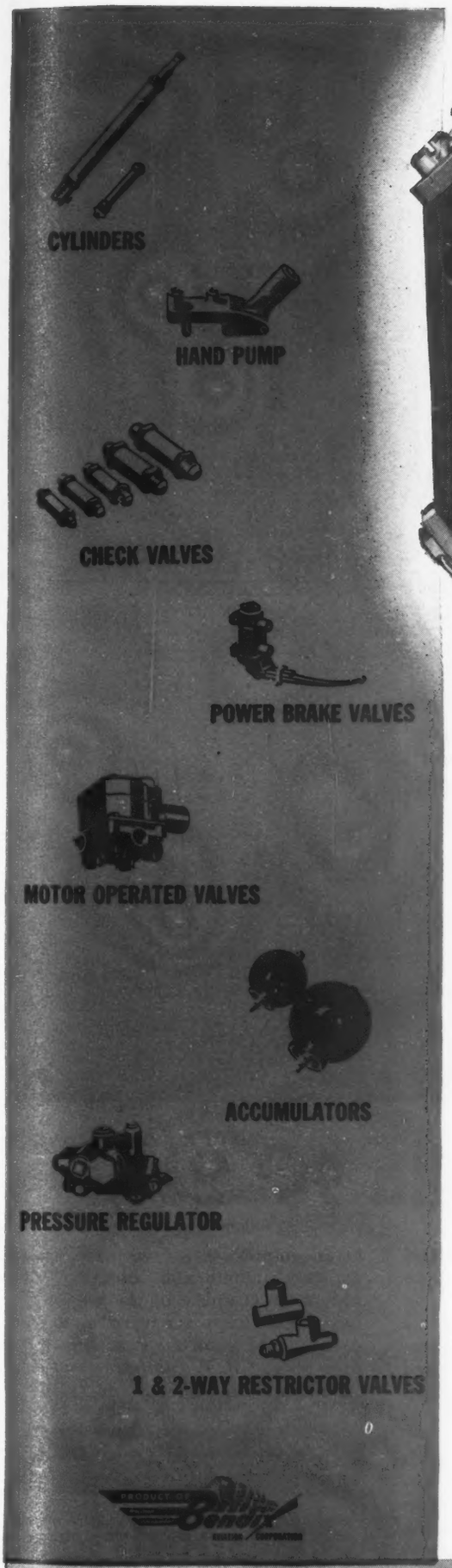
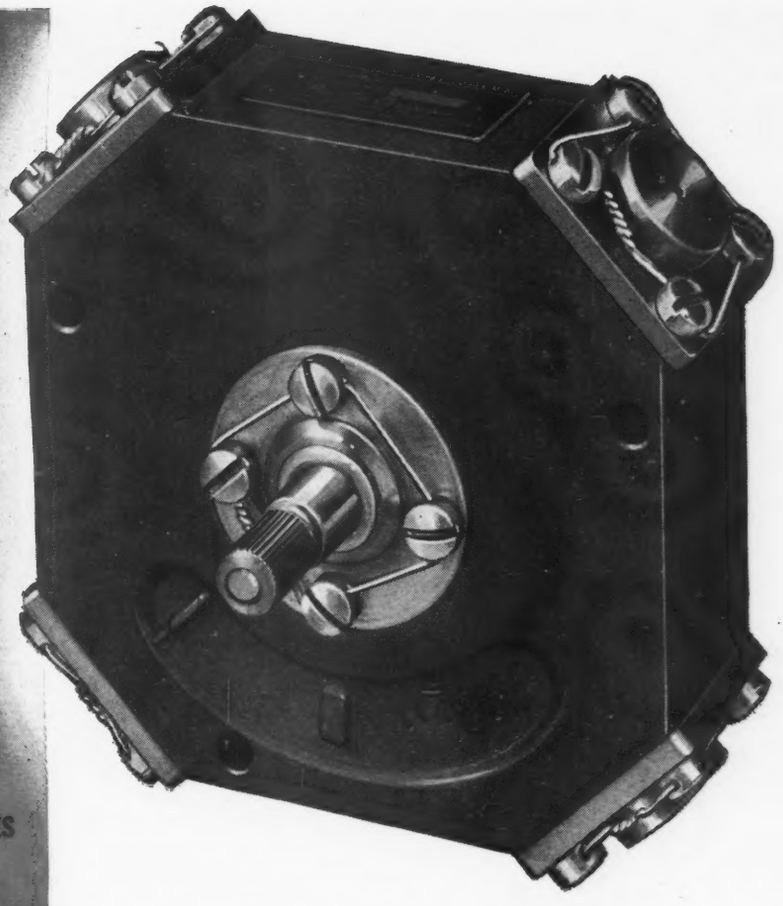
AV-1429

"NO REFRIGERATION SYSTEM IS BETTER THAN ITS AIR DISTRIBUTION"





THE NEW BENDIX PACIFIC

4-WAY SELECTOR VALVES

FOR 3000 PSI HYDRAULIC SYSTEMS

Pacific Division has engineered these new Four-Way Selector Valves for hydraulic system pressures up to 3000 PSI.

The valves incorporate Pacific Division's exclusive patented Plastic Poppets which seat directly in the body without inserted seats and which are interchangeable in service. Cored fluid passages in the permanent mold aluminum alloy body are *oval* in cross-section, providing greater flow without increasing the weight or size of the valve. The unit weighs only 1 pound. Handle load of the valve is 25 inch pounds at 3000 PSI.

In addition to the ⅜ T. S. Selector Valves, Pacific Division has available the other 3000 PSI hydraulic equipment shown at the left. Write today for complete data on this advanced equipment. Pacific Division, Bendix Aviation Corporation, 11600 Sherman Way, North Hollywood, California. Sales Engineering Offices in New York and St. Louis.

Pacific Division
Bendix Aviation Corporation
NORTH HOLLYWOOD, CALIF.

HYDRAULIC AND ELECTRICAL EQUIPMENT FOR AIRCRAFT

© 1946, Bendix Aviation Co

He's shaking hands with 90° below

RUBBER PARTS for planes have to function properly at the lowest temperatures apt to be encountered in flight. So B. F. Goodrich moved those temperatures into the testing laboratories.

They built a large new "cold room" —a refrigerator 30 feet long and 15 feet wide. In three of five chambers, a temperature of 64° below zero can be maintained. And then there's the extra-cold chamber where a smaller box manufactures a 90° below temperature.

The man in the picture above is testing airplane hose in the extra-cold chamber. The hose has to be able to flex in stratosphere cold. B. F. Goodrich technicians know that if it can stand *this* test and stay flexible, there is little to fear from nature.

The war proved how necessary this kind of testing is. Ground temperatures of 65° below were encountered in Alaska and Siberia. And at high altitudes, even lower temperatures were recorded.

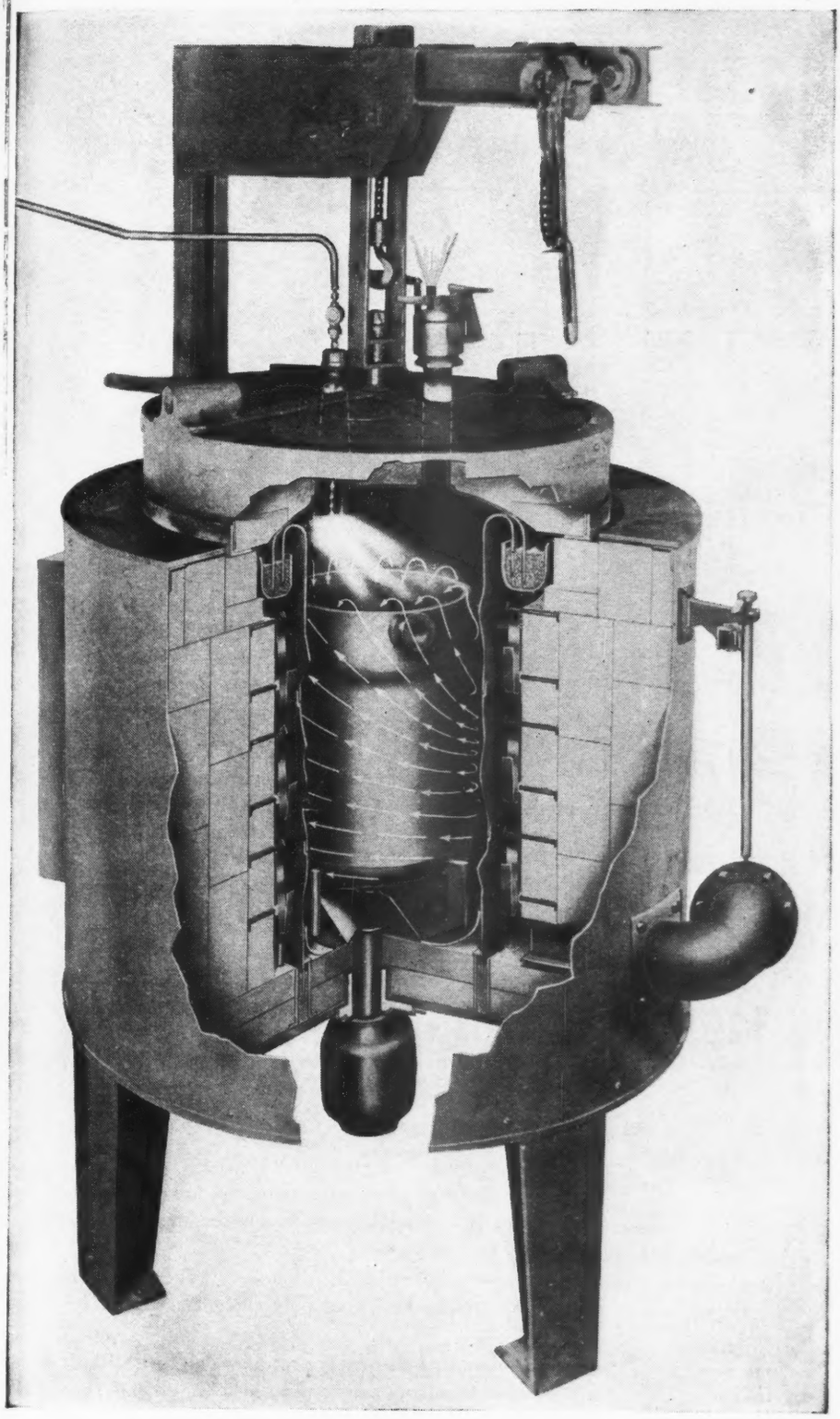
That's why so many B. F. Goodrich products for planes now get the sub-zero treatment. Hydraulic hose, carburetor diaphragms, accumulators, de-icing equipment, air valves, fuel cells and others have to prove they function properly at low temperatures before they get on an airplane.

This new B. F. Goodrich cold room is an important aid to new product development and research. It is one more example of the way B. F. Goodrich keeps ready to meet the demands of *tomorrow's* aviation customers. *The B. F. Goodrich Company, Aeronautical Division, Akron, Ohio.*

Skyway or Highway

B.F.Goodrich

FIRST IN RUBBER



Homocarb Method combines Micromax Temperature Control and Homocarb Furnace with cooler, in order to produce carburized parts which not only meet the most rigid specifications for metallurgical structure, but also have the extreme uniformity which spells economical production.

NEW QUICK COOLING FOR HOMOCARB FURNACE

In carburizing of metal parts, the Homocarb Method now includes a device to furnace-cool the work uniformly and quickly, under protective atmosphere. Temperature is carried down to the point at which the work is removed to the quench or slow-cooling unit.

The cooler works on a simple principle. It admits a stream of atmospheric air at the base of the Furnace. Rising by natural convection past the heaters, in the space between the furnace retort and the refractory, this stream cools the furnace about five times as fast as it would cool otherwise. The retort remains sealed during cooling and its protective atmosphere is maintained. The cooler can be added to Furnaces now in service.

Quick cooling is only one of four important Homocarb Furnace functions which combine to make the Homocarb a completely integrated equipment. Others are:

Accurately-metered supply of chemically-constant carburizing gas, supplied by scientifically-designed Homocarb Fluid.

Accurately-controlled, clean heat from the famous Homocarb electric heater.

Uniform distribution of hot gas, achieved by the Homo Method. A powerful fan, circulating gas along short, stream-lined passages and forcing it through the load, achieves entirely homogeneous results, for highest-quality production.

If you have a carburizing problem, an L&N engineer will gladly call; or you'll find general information in Catalog T-623, sent free on request.

LEEDS & NORTHRUP COMPANY, 4906 STENTON AVE., PHILA. 44, PA.

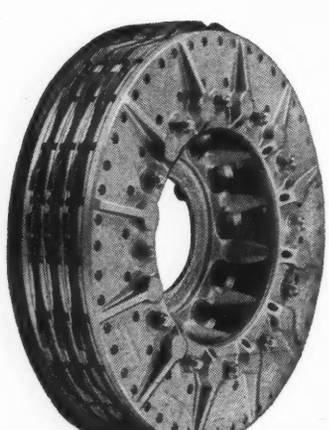
LEEDS & NORTHRUP

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

Jrl Ad T-623(21)

ONE BRAKE DESIGN

GIVES MAXIMUM BRAKING EFFICIENCY



DESIGN FEATURES—Fixed discs are faced with friction lining; lining is segmented to scavenge lining dust and provide air circulation. Eliminates fading and gives greater braking force with less contact pressure. Rotating members, keyed to the wheels, provide large heat-absorbing capacity.

Rotors are made in segments instead of a continuous ring; this allows for heat expansion without warping or cracking.

For a globe-circling airliner or a small private plane the new Bendix* disc brake is completely adaptable.

The *same* principle of construction, the *same* compact, simple design give the *same* outstanding braking results regardless of the size or type of plane.

Ranging in size from 5″ to 31″ diameters, low hydraulic displacement and greater heat-absorbing capacity combine to assure safer landings.

The heat-absorbing elements or rotors which turn with the wheel are made in segments rather than in a continuous ring. These segmented rotors have greater heat-absorbing capacity and eliminate fading, or warping of either the rotating or fixed members.

Especially important to plane manufacturers is that this design also permits considerable weight reduction in wheel and brake assembly, reducing operation costs and increasing efficiency. It will pay you to get complete details on this new and better brake.

*REG. U. S. PAT. OFF.

Bendix AVIATION CORPORATION

BENDIX PRODUCTS DIVISION

BENDIX AVIATION CORPORATION • SOUTH BEND 20, INDIANA

Bendix* Landing Gear • Bendix Pneudraulic* Shock Struts • Bendix Airplane Wheels • Airplane Brakes • Hydraulic Master Cylinders and Power-Brake Valves make up the list of Bendix Landing Gear Equipment.

THE FAILURE OF "FACT-FINDING"

THE PRESIDENT has asked Congress to grant him authority to appoint fact-finding boards to deal with nationally important labor disputes. Most citizens would like to see some reasonable and objective solution of the industrial strife that now is disrupting reconversion. Unfortunately, the record of the "fact-finding" procedure indicates that any claim of impartiality for this process is a gross misrepresentation.

The Administration bill would authorize the President to appoint such boards in cases certified to him by the Secretary of Labor. Each board would report to the President "its findings of fact and such recommendations concerning the dispute as the board deems appropriate." Its facilities and staff would be provided by the Secretary of Labor. The bill provides for an interval of not more than 30 days known as a waiting or "cooling off" period during which it would be "unlawful" (though no penalties are specified) for anyone to promote or encourage work stoppages.

Because the Administration did not wait for Congressional action upon its proposal, but appointed a number of fact-finding bodies to deal with current emergency cases, we have been afforded at least a partial preview of how the procedure may be expected to work out if laws establishing it are passed.

If the reports handed down by the fact-finding panels in the General Motors and oil disputes may be regarded as representative, it can be stated conclusively that Government-appointed "fact-finding" boards will concern themselves to only a minor degree with the establishing of facts. A far greater share of their effort will be concerned with the speculative business of forecasting future output and production efficiency and appraising the "ability to pay" of the companies involved. But the predominant emphasis will be placed upon framing recommendations for settling the disputes in line with announced Government wage-price policy.

In short, the procedure essentially will be one of registering with the public a government opinion as to how far wages may be raised in the cases at issue without raising price ceilings. Both the General Motors and the Oil Panels stated, in quite explicit terms, that this was their conception of the job assigned them.

"Fact-Finding" in Auto and Oil Disputes

As the General Motors Panel phrased it: "This board subscribes to, and has been guided by, the national wage-price policy" — which it summarizes as calling for wage increases to maintain take-home pay at wartime levels, to the degree possible without inflationary price rises.

The Oil Panel was even more forthright in the statement of what it was supposed to do. "In the judgment of the panel," it declared, "the earnings of the workers must be as high as is consistent with both the maintenance of the stability of the price structure and the provision for reasonable returns to the owners of industry." In other words, prices and the return to investors are to remain fixed, with labor entitled to an ever-increasing return up to the limit of what the traffic will bear.

Having thus outlined their respective conceptions of the job, each panel proceeded to carry out its mission.

The Automobile Panel recommended that General Motors increase its basic hourly wage rates by 19½ cents, which amounts to about a 17½ per cent increase on the company's average hourly wage of $1.12. The Oil Panel recommended an 18 per cent increase in basic hourly wage rates, or an additional 21 cents to the average wage rate of $1.20.

The General Motors recommendation was based almost exclusively upon the Panel's calculation that a 19½ cent raise would keep weekly take-home pay equal to that earned in 1944 when the work-week averaged 45.6 hours. The calculation turned on an estimate of what the effective work-week was likely to be in 1946.

The Oil Panel's recommendation appears to have been based on a more complex but no more conclusive accounting. After calculating that the maintenance of July 1945 take-home pay after 40-hour shifts were restored would require a 22 per cent increase in straight-time hourly wages, it recommended that an 18 per cent increase be made. It accounted for 9½ per cent of this by noting that this was needed to cover cost-of-living rises, and explained that the rest was justified by a combination of factors including loss of premium overtime pay, higher productivity, and settlements already negotiated. Since the Panel gave no indication of the weight given to these several factors, it may not be unfair to assume that the last-named was given preponderant importance, since 18 per cent was the increase already granted in collective bargaining by Sinclair and certain other oil companies.

Higher Pay Without Higher Prices

Both panels stated that the pay increases recommended could be met without raising price ceilings, but neither documents its case on this score with very conclusive "facts".

The Oil Panel confined its observations on this account to the statements that only one company in its group had pleaded "inability to pay" and that the industry was in a generally profitable position during 1943 and 1944.

The Automotive Panel stated that, under a number of assumptions about the 1946 operations of General Motors which it believed to be valid, the Company would have higher earnings than it had in 1941, its previous record year. It specifically stated that its findings in the case were not applicable outside the

automobile industry, but it recognized that the General Motors settlement would more or less determine the settlements of other automotive companies. It stated that it had not been able to arrive at a clear conviction as to the ability of other auto makers to pay similar wage advances, but it dismissed the issue by observing that they could expect to operate at full capacity in 1946, and that this should provide savings to offset the increased wage expenditures.

From the management point of view, one of the most serious limitations in the panels' procedure was their failure to deal with any of the Company claims put forward. In ordinary collective bargaining the demands of both sides are advanced and concessions in one direction are traded for concessions in the other. Here, although the companies involved had insisted upon their need for guarantees against contract violations and wild-cat strikes, and for other union concessions, nothing but the wage issue was considered by the "fact-finding" bodies. The General Motors Panel specifically recommended that the wage increase of 19½ cents be granted, but that otherwise "the status quo prevailing before the strike be restored by the reinstatement of the 1945 contract between the parties." Handled thus, fact-finding becomes indeed a wholly one-sided exercise.

Both panels accepted, quite uncritically, the general position taken by Government spokesmen that wage increases are inflationary only if they are directly translated into price advances. It should be obvious that all wage increases add to the inflationary pressure, if made at a time like the present when consumer purchasing power far outstrips the volume of goods and services available to satisfy it.

"Fact-Finding" Dodged in Steel and Rails

It is ironic, too, that even while the Automotive and Oil Panel groups were holding the "government policy" line, the President and his Reconversion and Stabilization Directors were busily at work trying to dent it. In the steel dispute, although price rises in this industry have a particularly sharp inter-industry impact, hearings by the appointed fact-finding board were deferred while negotiations were carried forward by the President and his advisors under which the industry was offered a price increase of approximately $4.00 a ton on condition that U. S. Steel and the United Steelworkers agree upon a mutually acceptable wage boost. It is hard to avoid the cynical conclusion that wage increases constitute the major administration policy, and that the principle of not translating them into increased prices is sacred only in those cases where there can be some reasonably plausible showing that wages may be raised without price advances.

Much the same general conclusion — that the "facts" are controlling only if they support a substantial wage increase — is sustained by the history of the administration of the Railway Labor Act of 1926, often cited as a glowing example of how "fact-finding" by so-called Emergency Boards of Presidential appointees has served to prevent strikes on the railroads. It is true that reports of almost all of the 31 Emergency Boards appointed to look into threatened railway strikes in the 20 years since the act was passed have provided the basis for a settlement of the disputes in question. The fact — a real fact — remains, that in 1941 and again two years later the wage adjustments found appropriate by Emergency Boards in major railway labor disputes were revised upwards at the White House after the unions involved rejected them as unsatisfactory and threatened to strike. The second upward revision was made after government seizure of the railroads to prevent a national transportation tie-up. When the "facts" did not indicate a large enough wage increase to satisfy the union and the Administration, the "facts" went out the window.

It would be irresponsible to deny the importance of finding some tenable solution of current disputes that threaten to completely disrupt the reconversion process. But upon the evidence of experience, "fact-finding" boards cannot be expected to operate according to the common conception of their function — as agencies designed to sift out for the public an objective and significant weighing of the facts behind conflicting claims.

Without Principles Facts Mean Little

Facts, if they are assembled upon a sufficiently partisan basis, can be made to document almost any case one wishes to establish. The major difficulty in marshalling facts to resolve wage disputes is that there are no agreed-upon principles to determine the levels at which wages should be set. In the absence of such principles, it is inevitable that "fact-finding" boards, appointed by the Administration, manned largely by those who helped develop and administer Administration wage policies, and depending for technical assistance upon Administration Departments, will serve merely to implement Administration wage policy.

If Government means to reassert its wartime authority to fix wages — an objective specifically disavowed by the President and seemingly wanted by no one — it should accept the responsibility directly, rather than operate to that end through "fact-finding" boards which are independent in theory, but which cannot be so in fact.

The failure of the brand of "fact-finding" now urged upon Congress by the President is evident. Therefore, we must look for a solution along other lines.

What is needed is for labor and management to agree upon the principles that should govern the determination of wages under free collective bargaining. When such agreement is reached, then and only then, can fact-finding become an objective and useful instrument for settling wage disputes.

President, McGraw-Hill Publishing Co., Inc.

EDITORIAL

OUR PERSONAL PLANES MUST NOT BE AS LETHAL AS AUTOS

WITHIN A FEW SHORT WEEKS, spring will be in the air—and so will hundreds of new personal pilots, plus an indeterminate number of veterans whose thirst for flying has not been satiated by their war experience. The postwar boom is on as we enter what promises to be the biggest year thus far in the history of personal aircraft activity.

Through unprecedented cooperation between government and industry, a favorable regulatory environment has been created. It has been made much easier for people to learn to fly, and fly within the law. And war-earned money still burns holes in American pockets in spite of the best efforts of our citizens to get rid of it. All of this is on the plus side of the picture.

On the minus side is the well founded fear that the pilots of personal aircraft, in the flush of their newly found freedom from regulations, may forget the responsibility for restraint that is entailed. Already we have had too many serious accidents resulting from the failure of ex-combat pilots to realize the performance limitations of light planes. The frequently tragic consequences of exhibitionism in flying have claimed victims not only among military pilots but among the ranks of newcomers in the art.

One airline pilot has become so alarmed that he has written a foreboding article called "The Coming Massacre in the Skies". He contends that the answer is "responsibility and regulation". Then he forgets responsibility and dwells on regulation. He envisions more stringent regulations with some sort of police enforcement. All of this makes good reading as long as you keep it on paper. But when you try to do something about it, it is quite another matter.

IT IS ALL WELL AND GOOD to theorize about lifting our highway traffic regulation system into the third dimension. When we do it we increase its imperfections in proportion. The cold, hard fact remains that, in spite of all the highway Galahads, automobiles normally kill off about a hundred people every day, yet few people worry much about it. Most of the gentlemen who uphold law and order on the road give out tickets for minor offenses which don't have much bearing on safety. Pennsylvania considers 50 mph. safe, while New Jersey thinks it ought not be more than 35. The traffic cop follows the book blindly, and he isn't qualified to judge what constitutes safe or reckless driving. So it would be in the air—only more so. And the cost would be prohibitive, to say the least.

For these and other reasons it behooves us to think more about responsibility and less about regulation. We have made the first real progress in aviation history toward sensible, adequate regulation. It would be unfortunate to reverse this trend. Yet we cannot hope to maintain our gains in this direction if we abuse the privilege. The only people who can enforce the safety rules are the men who operate the airports. Theirs is a large part of the responsibility for safe flying. Manufacturers of planes and equipment also have a share, but the airport is the center of the operating community.

THE AIRPORT GRAPEVINE is so effective that it would take only an occasional example to convince the customers that an operator meant what he said about obeying the rules. The business lost by grounding a rule breaker would be replaced many times by people who value their own necks and want to fly at a field where things are done as they should be. But the operator's responsibility doesn't end there.

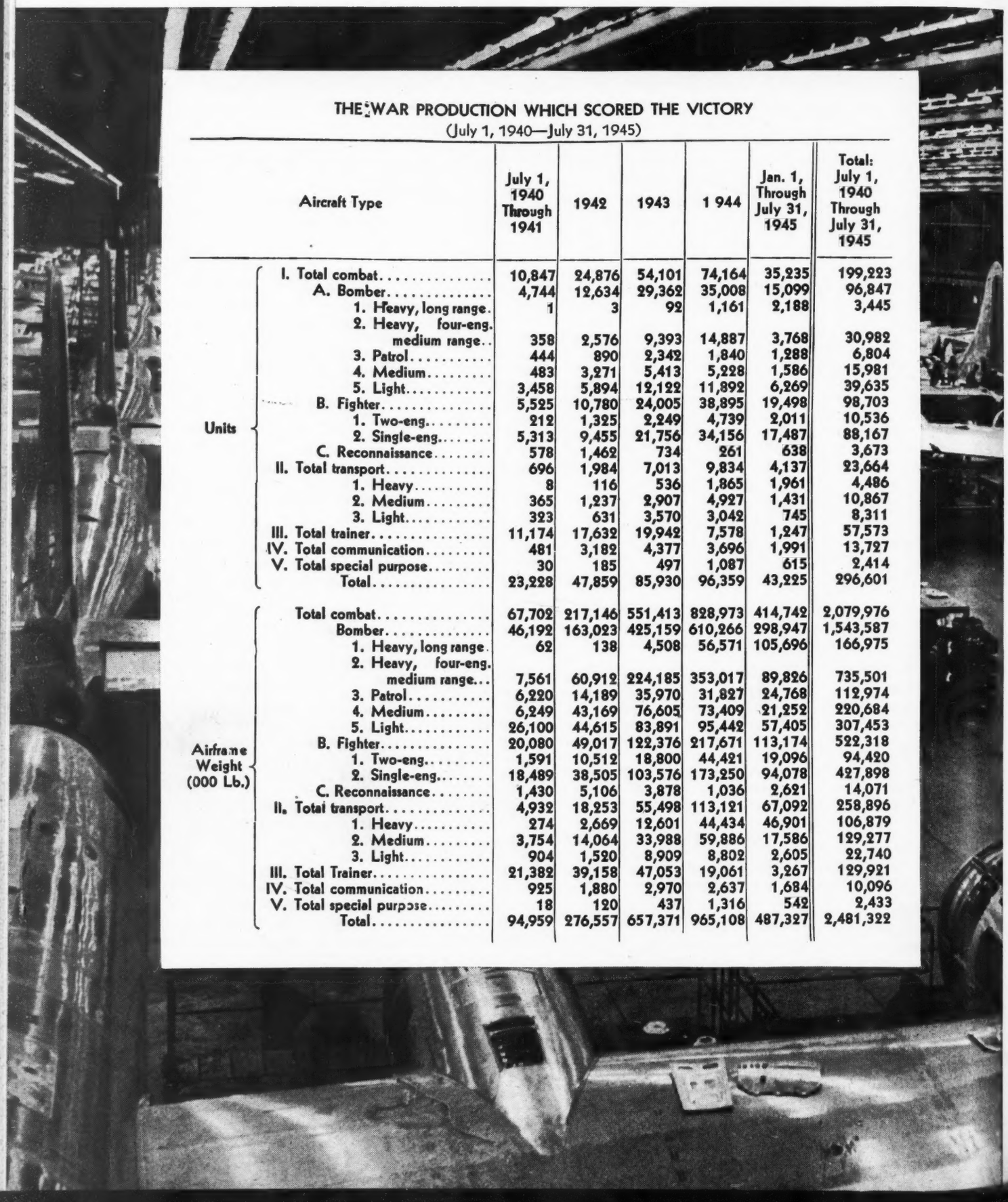
Every flying instructor must consider it his most important duty to impart to every student a profound appreciation of the limitations of the airplane. The airplane can do many wonderful things, but there are quite a few things it cannot do. No student should be taught to fear an airplane. But everyone must be taught to avoid pushing planes beyond the limits of their capabilities. No school operator can afford to employ, even for a minute, any instructor unable or unwilling to develop this frame of mind in his students.

The American public appears to be willing to accept massacre on the highways. But it will not tolerate a massacre in the sky. If we refuse to consider the seriousness of this problem, the cause of liberalized regulation will be set back many years. Insistance, by the operators at the airports, on sound flight instruction methods and strict adherence to the rules is the only practicable answer.

Leslie E. Neville

EDITOR

OUR INDUSTRY'S RECORDS AND RANGES

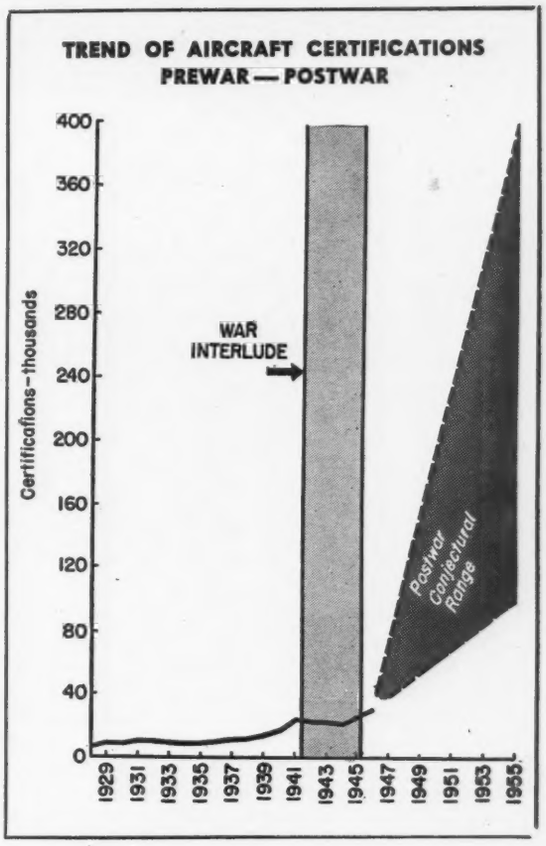


THE WAR PRODUCTION WHICH SCORED THE VICTORY

(July 1, 1940—July 31, 1945)

	Aircraft Type	July 1, 1940 Through 1941	1942	1943	1 944	Jan. 1, Through July 31, 1945	Total: July 1, 1940 Through July 31, 1945
Units	I. Total combat	10,847	24,876	54,101	74,164	35,235	199,223
	A. Bomber	4,744	12,634	29,362	35,008	15,099	96,847
	1. Heavy, long range	1	3	92	1,161	2,188	3,445
	2. Heavy, four-eng. medium range	358	2,576	9,393	14,887	3,768	30,982
	3. Patrol	444	890	2,342	1,840	1,288	6,804
	4. Medium	483	3,271	5,413	5,228	1,586	15,981
	5. Light	3,458	5,894	12,122	11,892	6,269	39,635
	B. Fighter	5,525	10,780	24,005	38,895	19,498	98,703
	1. Two-eng.	212	1,325	2,249	4,739	2,011	10,536
	2. Single-eng.	5,313	9,455	21,756	34,156	17,487	88,167
	C. Reconnaissance	578	1,462	734	261	638	3,673
	II. Total transport	696	1,984	7,013	9,834	4,137	23,664
	1. Heavy	8	116	536	1,865	1,961	4,486
	2. Medium	365	1,237	2,907	4,927	1,431	10,867
	3. Light	323	631	3,570	3,042	745	8,311
	III. Total trainer	11,174	17,632	19,942	7,578	1,247	57,573
	IV. Total communication	481	3,182	4,377	3,696	1,991	13,727
	V. Total special purpose	30	185	497	1,087	615	2,414
	Total	23,228	47,859	85,930	96,359	43,225	296,601
Airframe Weight (000 Lb.)	Total combat	67,702	217,146	551,413	828,973	414,742	2,079,976
	Bomber	46,192	163,023	425,159	610,266	298,947	1,543,587
	1. Heavy, long range	62	138	4,508	56,571	105,696	166,975
	2. Heavy, four-eng. medium range	7,561	60,912	224,185	353,017	89,826	735,501
	3. Patrol	6,220	14,189	35,970	31,827	24,768	112,974
	4. Medium	6,249	43,169	76,605	73,409	21,252	220,684
	5. Light	26,100	44,615	83,891	95,442	57,405	307,453
	B. Fighter	20,080	49,017	122,376	217,671	113,174	522,318
	1. Two-eng.	1,591	10,512	18,800	44,421	19,096	94,420
	2. Single-eng.	18,489	38,505	103,576	173,250	94,078	427,898
	C. Reconnaissance	1,430	5,106	3,878	1,036	2,621	14,071
	II. Total transport	4,932	18,253	55,498	113,121	67,092	258,896
	1. Heavy	274	2,669	12,601	44,434	46,901	106,879
	2. Medium	3,754	14,064	33,988	59,886	17,586	129,277
	3. Light	904	1,520	8,909	8,802	2,605	22,740
	III. Total Trainer	21,382	39,158	47,053	19,061	3,267	129,921
	IV. Total communication	925	1,880	2,970	2,637	1,684	10,096
	V. Total special purpose	18	120	437	1,316	542	2,433
	Total	94,959	276,557	657,371	965,108	487,327	2,481,322

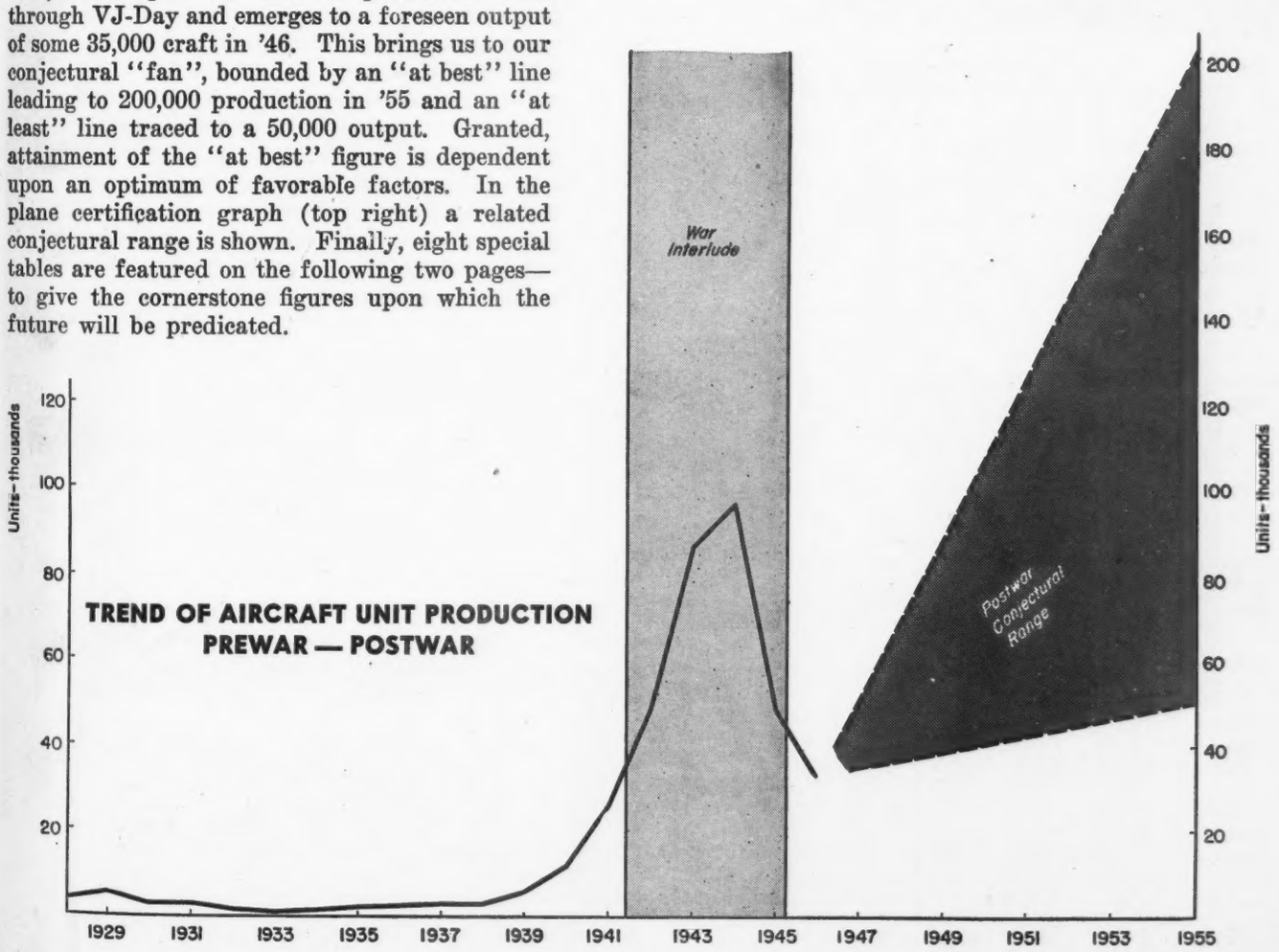
Major contributor, as mankind triumphed in its greatest war, was American aviation—which can now anticipate a new vital civil role as mankind attempts to shape its most needed peace. To gage potentialities, Aviation offers this terse chart-and-table analysis, marking the route the industry has already traveled, giving a "fix" on its present position, and 'scoping the broad horizons ahead.



NOW totaled on a final single tab sheet—to stand as the paramount record of industrial performance—is America's supreme anti-Axis aviation production effort. And in sharp black and white, these figures (opposite page) tell an almost unbelievable story—296,601 military planes, comprising the well-nigh inconceivable total weight of 2,481,322,000 airframe pounds, turned out between mid-'40 and mid-'45.

Today, with this vast war job checked off, the industry mo[illegible] to complete its comprehensive reconversion. And now, in this initial postwar year of '46, there is a countrywide mustering of aviation facilities to meet the promising demands of the first new-peacetime Spring. The two accompanying charts give perspective as to how far civil aviation has come since the '20s, along with "possibility fans" encompassing the concensus of forecasts into the '50s.

In our prime graph below, plane production is seen attaining a minor peak in '29, then dropping to hug bottom in '33, finally beginning a new rise in '39 as war broke out in Europe. The lofty summit in the American war interlude follows, whereupon the line of production falls through VJ-Day and emerges to a foreseen output of some 35,000 craft in '46. This brings us to our conjectural "fan", bounded by an "at best" line leading to 200,000 production in '55 and an "at least" line traced to a 50,000 output. Granted, attainment of the "at best" figure is dependent upon an optimum of favorable factors. In the plane certification graph (top right) a related conjectural range is shown. Finally, eight special tables are featured on the following two pages—to give the cornerstone figures upon which the future will be predicated.



A QUICK CHECK OF FACTORS ON WHICH WE BUILD

PORTS & FLYING FACILITIES

Year	Airports & Fields				Improvements & Aids to Avigation					
	Commercial	Municipal	All Others	Total	Lighted Fields	Lighted Route Mileage	Airway Beacons	Radio Range Stations	Weather Reporting Stations	Traffic Control Centers
1927	263	240	533	1,036	...	4,468	760	...	...	...
1928	365	368	631	1,364	...	6,988	1,188	...	...	...
1929	495	453	602	1,550	...	12,448	1,311	9	58	...
1930	564	550	668	1,782	640	15,258	1,652	33	143	...
1931	829	780	484	2,093	680	17,512	1,836	47	234	...
1932	869	777	471	2,117	701	19,500	1,988	68	234	...
1933	939	827	423	2,188	626	18,655	1,796	94	205	...
1934	872	980	445	2,297	664	19,081	1,520	112	206	...
1935	822	1,041	505	2,368	698	22,012	1,868	137	203	...
1936	774	1,037	531	2,342	705	22,245	1,918	146	213	5
1937	727	1,053	519	2,299	720	22,319	1,969	180	271	8
1938	760	1,092	522	2,374	719	23,723	1,967	215	314	9
1939	801	963	516	2,280	735	27,074	2,089	244	298	12
1940	860	1,031	440	2,331	776	30,480	2,261	281	376	14
1941	930	1,086	468	2,484	662	32,679	2,274	312	453	15
1942	1,069	1,129	611	2,809	700	33,407	2,221	280	442	23
1943	801	914	1,054	2,769	859	33,403	2,178	291	365	23
1944	1,027	1,067	1,033	3,427	964	34,424	2,160	297	535	24

FEDERAL APPROPRIATIONS FOR RESEARCH & DEVELOPMENT

(Thousands of Dollars)

Fiscal Year	NACA			CAA Technical Development and Research	Navy	Army
	Total	General Expense	Construction			
1915–20	590	454	136	.....	.....	.....
1921	200	184	16	.....	2,935	5,623
1922	200	189	11	.....	3,705	5,261
1923	226	211	15	.....	1,117	3,216
1924	307	307	.....	.....	1,600	2,888
1925	470	437	33	.....	1,573	2,984
1926	534	437	97	.....	1,550	2,683
1927	513	513	.....	.....	1,928	2,208
1928	550	525	25	.....	1,729	2,189
1929	629	624	5	.....	2,000	2,250
1930	1,508	745	763	.....	2,000	2,239
1931	1,321	886	435	.....	2,000	2,265
1932	1,051	1,051	.....	.....	2,295	2,286
1933	915	915	.....	.....	2,210	3,171
1934	957	709	PWA248	.....	2,189	3,009
1935	1,245	767	PWA478	.....	1,773	3,487
1936	1,178	1,178	.....	.....	2,498	5,724
1937	2,545	1,178	1,367	50	2,500	4,506
1938	1,734	1,381	353	292	3,500	4,339
1939	3,869	1,529	2,340	247	2,904	3,484
1940	4,375	2,044	2,331	687	9,500	10,000
1041	11,200	2,800	8,400	757	10,004	102,231
1942	19,866	6,200	13,645	943	27,087	98,199
1943	25,429	13,114	12,315	1,146	46,840	113,343
1944	38,392	19,635	18,757	816	79,967	121,648
1945	45,442	26,557	18,885	891	.....	.....
1946 (Est.)	26,014	26,014	.....	1,014	.....	.....

PREWAR EMPLOYMENT AVIATION & ALLIED INDUSTRY

(1939 Breakdown)

Type	Number of Workers
Manufacturing & Allied	96,000
Air-Carrier	23,100
Non-Air-Carrier	10,600
Airports	6,300
Government	6,300
Total	142,300

PREWAR NON-SCHEDULED COMMERCIAL FLIGHT MILES

(1939 Breakdown)

Type	Miles	Percent
Sight-Seeing	15,018,588	43.8
Charter	11,075,351	32.3
Aero. Photog., Mapping	3,908,948	11.4
Planting, Crop Dust	1,097,248	3.2
All Others	3,188,878	9.3
Total	34,289,013	100.0

DOMESTIC AIRLINE TRAFFIC, CAPACITIES, & MILEAGE

Year	Traffic		Capacities				Route Mileage			
	Total Passengers	Passenger-Miles Flown	Aircraft in Service	Average Available Seats	Total Seating Capacity	Average Speed Mph.	All Services	Express	Mail	Passenger
1932	474,279	127,038,798	456	6.58	3,000	109	28,550	.....	.....	.....
1933	493,141	173,492,119	408	7.59	3,097	116	27,812	.....	.....	.....
1934	461,743	187,858,629	417	8.85	3,690	127	28,084	27,935	27,182	26,636
1935	746,946	313,905,508	356	10.34	3,681	142	28,267	28,267	25,968	28,267
1936	1,020,931	435,740,253	272	10.67	2,902	149	28,874	28,874	27,533	28,874
1937	1,102,707	476,603,165	282	12.53	3,533	153	31,084	31,084	31,029	31,084
1938	1,343,427	557,719,268	253	13.63	3,448	153	35,492	34,945	34,272	35,492
1939	1,876,051	749,787,096	265	14.63	3,877	153	35,213	35,213	34,519	35,213
1940	2,959,480	1,147,444,948	358	16.52	5,914	155	41,054	41,054	40,461	41,054
1941	4,060,545	1,491,734,671	359	17.41	6,250	159	41,915	41,915	41,100	40,538
1942	3,551,833	1,481,976,329	179	17.60	3,150	159	36,442	36,442	35,641	35,168
1943	3,454,040	1,642,596,640	194	17.61	3,416	160	36,982	36,982	36,982	34,893
1944	4,668,466	2,264,282,453	279	17.53	4,891	162	40,392	40,392	40,392	39,251

CERTIFIED PILOTS, MECHANICS, & INSTRUCTORS

As of Jan. 1	Certified Airplane Pilots				Glider Pilots	Mechanics	Ground Instructors
	Airline Transport	Commercial	Private	Total			
1933	330	7,967	10,297	18,594	209	8,373	86
1934	554	7,635	5,771	13,960	149	8,226	63
1935	676	7,484	5,789	13,949	109	8,156	59
1936	736	7,362	6,707	14,805	145	8,432	55
1937	842	7,288	7,822	15,952	138	8,738	48
1938	1,064	6,411	10,206	17,681	161	9,314	55
1939	1,159	7,839	13,985	22,983	172	9,884	92
1940	1,197	8,280	21,787	31,264	170	10,296	446
1941	1,431	10,151	51,531	63,113	138	11,177	1,948
1942	1,587	15,429	83,771	100,787	160	14,047	4,815
1943	2,177	18,808	89,525	110,510	211	18,097	7,604
1944	2,315	20,587	99,982	122,884	1,435	20,332	12,739
1945	3,046	22,059	107,327	132,432	2,412	23,152	14,647

UNIT PRODUCTION OF AIRCRAFT ENGINES

Year	Civil	Military	Total
1917–19	.....	44,453	.....
1926	.....	842	.....
1927	.....	1,397	.....
1928	632	2,620	3,252
1929	5,517	1,861	7,378
1930	1,925	1,841	3,766
1931	1,976	1,800	3,776
1932	813	1,085	1,898
1933	1,120	860	1,980
1934	2,048	688	2,736
1935	1,974	991	2,965
1936	2,433	1,804	4,237
1937	4,095	1,989	6,084
1938	.....	.....	.....
1939	.....	.....	11,172
1940	.....	.....	13,669
1941	.....	50,684	.....
1942	.....	136,767	.....
1943	.....	226,561	.....
1944	.....	256,571	.....

PREWAR OUTPUT OF PERSONAL AIRCRAFT

Year	Total Civil Aircraft	Total Personal Aircraft	Light Personal Aircraft (Under $2,000)	Large Personal Aircraft (Over $2,000)
1933	591	467	2	465
1934	772	618	1	617
1935	1,109	917	436	481
1936	1,559	1,423	889	534
1937	2,281	2,042	1,523	519
1938	1,823	1,711	1,363	348
1939	3,715	3,555	3,029	526
1940	6,785	6,472	4,455	2,017
1941	6,844	6,597	4,312	2,285

FINANCE

FINANCIAL YARDSTICKS FOR '46

First Postwar Year Finds Companies Jockeying For Lead in Sales Race

By **RAYMOND L. HOADLEY,** *Financial Editor, "Aviation"*

Coming out of the war with sound working ledgers, the aircraft manufacturers are spurring their initial peacetime backlogs of military, commercial, and personal planes to gain first-lap advantages in the rigorous competition now looming.

IT'S GOING TO BE DIFFERENT this year There are a number of developments ahead that should tempt the stock market to abandon its neutral position on aircraft manufacturing stocks.

Aircraft stocks finally worked up to the cautious point late last year, share prices becoming about equal to the net working capital position of the respective companies. Such a watch-and-wait attitude in the midst of a general stock market boom may be abandoned in 1946 as the tide in aircraft affairs moves ahead sufficiently to permit better perspectives of where individual plane makers are heading.

As 1945 ended the aircraft companies were pretty much all in the same boat. All had had their war contracts cut to the bone. There was only one real war casualty—Brewster—though many company crackups had been expected two or three years ago. All other aircraft companies finished out the war in tip-top financial shape.

Wall Street prices reflected that excellent financial condition, but not much else. If the airlines, for example, sold on a similar basis, their prices would tumble fast and furiously.

So before the year becomes further advanced it would be well for the aircraft stockholder to see how things are shaping up so far—in order to be ready to evaluate further developments as they affect his individual stockholdings.

Analysts in the aircraft manufacturing field seem agreed that profits of the industry in 1946 will be pretty slim. Of course, the carry-back provisions in the corporate income tax laws will protect working capital, this tax cushion being a favorable factor that has been evident for some time. The question now is future earning power, and it is 1947 which holds the promise of being a year of substantial earnings for some companies.

First there's military procurement. It's still going to remain the industry's bread and butter business for years ahead. Some companies like Lockheed, Fairchild, and Grumman have considerable government production scheduled for this year, unless further cancellations are ordered. By and large, though, as matters stand today the military production future is obscure.

Competitions will be coming along for new planes, but no one knows yet how much the Army and Navy will have to spend on the outcome of these competitions. So the outlook in military business is one of the unknown factors. It's a case of watching carefully what policy and appropriations Congress decides upon and of noting who gets the resulting awards.

In the transport field the outlook should be clarified fairly soon. Orders have been placed for upward of $350,000,000 in commercial transports. But we will be well into 1947 before much of this business is translated into earning power. Douglas is in production on the DC-4, now flying the oceans and on order for long-haul airline express service, but full-scale production on the DC-6, a bigger and faster craft, will not come until late in 1947. First delivery is scheduled for June, and about 50% of the $100,000,000 backlog of orders for this plane will be completed by the end of the 1946 fiscal year. So far the company has not announced any firm orders for its DC-7 or the DC-8. This will be an active year at Douglas, but company officials are making no predictions on profits. Douglas, of course, is only one of the major companies which will have large development expenses on new models to write off this year.

All indications point to a profitable year for Lockheed. This company got the jump on competition in having its Constellation ready for production soon after the war ended. So Constellations will be coming off the line while the company readies its larger Constitution, details of which have not yet been released.

Also prominent in the picture is Boeing, which plans to build 50 Stratocruisers. It already has orders for 20 from PAA, and negotiations for further sales are stated to be underway with AA, NWA, TWA, and foreign agencies. First Stratocruiser is scheduled for delivery next fall.

Meanwhile, Martin and Consolidated Vultee are battling it out for the job

of building standardized medium-range airliners. Martin has orders for 122 of its Model 202, but the selling price was so low that trade circles figure Martin must mass produce 300 or more to get into the profit page of the ledger. And Consolidated Vultee is very much in the running with its big American Airline order for 100 of its Model 240. There will be further orders coming along from United Air Lines, Northwest, TWA, etc., for the various medium-range planes. When these are in it may be possible to tell who is going to get the lion's share of the business for this type of plane. Craft of several companies could feasibly fit the category.

Martin's initial 202 is due early in 1947. Delivery dates have not been set for Convair's 240. In the meantime Martin and also Douglas will be able to fortify 1946 earning power somewhat through their orders for reconverting military transports.

Republic also has been commissioned to reconvert war transports. In addition, this company will begin assembly line production this coming spring on its four-place Seabee amphibian, with subsequent output expected to reach 400 a month. Republic's 40-passenger Rainbow transport won't be ready for initial deliveries until 1947. However, its other production bids fair to develop good earning power this year.

Manufacturers of personal planes have a backlog of cash orders totaling around 50,000 craft, with actual production in 1946 expected to exceed 30,000 units. Piper probably will do well earnings-wise this year; some of the others may, too. But Wall Street will be inclined to look beyond 1946. Many believe that by 1947 Lockheed, North American Aviation, and perhaps other large companies, will be wedging into the personal plane field, as has Consolidated already. How will the little companies fare against such competition?

The answer is that many of the 200 firms interested in personal plane projects will go out of business when their stockholders' money runs out. The casualty lists in the helicopter and personal plane groups in the next half dozen years may be as large as those in the motor car field a few decades ago.

Assuredly, many observers can be found who agree with Lockheed's Pres. Gross that personal planes will represent aviation's largest and most lucrative market some day. But nobody can know ahead of time who, come that era, will be the Ford of the personal plane industry.

Another matter for those interested in aircraft stocks to watch this year will be the diversification plans of various manufacturers. Curtiss-Wright exemplifies the big company with surplus working capital that is anxious to branch out into allied, or even non-related fields, in order to diversify production. Already C-W has purchased one company making precision parts for both planes and automobiles as well as another concern which produces spring clutch assemblies.

Consolidated Vultee is stepping out into the non-aircraft field by making consumer goods for another company, and it plans further expansion in this direction. The aircraft companies have the money to go out and buy up promising concerns here and there. Some of these projects may turn out to be real money makers.

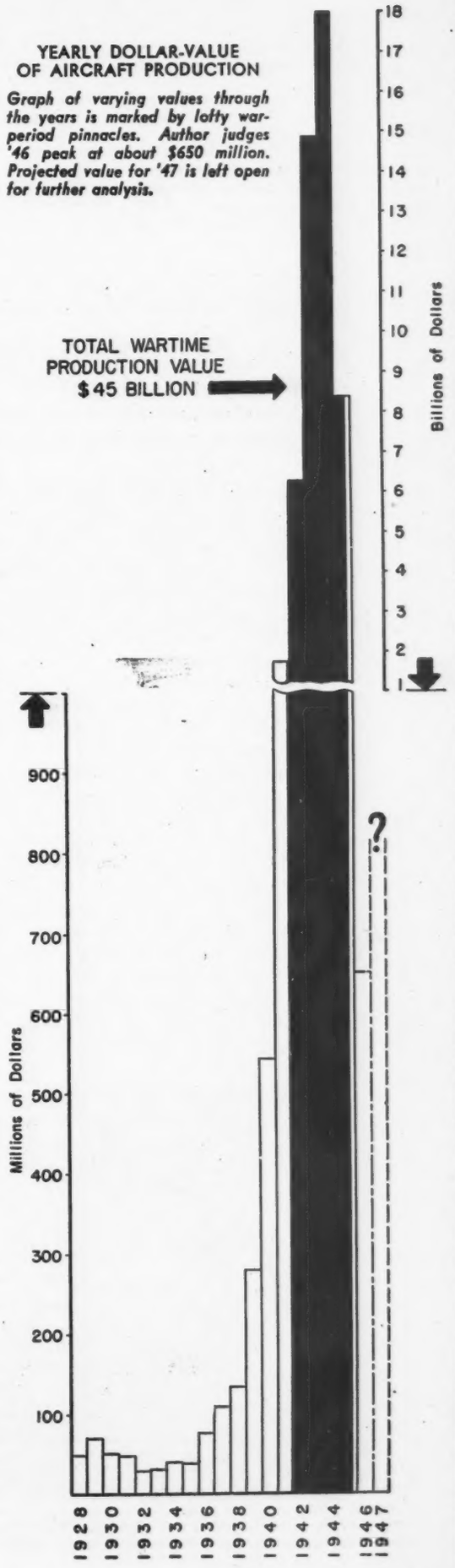
Another development inviting the attentive eye is the price trend. The automobile makers have been maintaining that they need higher prices for their new cars. But if that is true for auto manufacturers it goes double for the aircraft producers.

The auto industry is on the threshhold of several 6,000,000-car years. On the other hand the aircraft sales have dropped from $8,400,000,000 in 1945 to perhaps $650,000,000, in 1946. At the same time labor, material, and parts costs are rising. It's essential for the industry to get adequate prices for its products to be able to present stockholders with a reasonable profit margin on sales.

The export picture has yet to jell. True, the markets are there, but the industry has got off to a slow start in its move to exploit them. Exports probably won't be an important factor in 1946 aircraft business. And by the time 1947 rolls around, the ambitious British plane makers should be in a far better position to compete with us for world trade in aircraft products.

Apparently, our aircraft industry has decided to go out for world markets —on an individual basis as contrasted to the British method of collective promotion. Thus, the export plans of our various aircraft concerns, if and as they are unfolded, will have a bearing on future sales and earnings.

And so, there is a great competitive battle on this year for postwar position in the aircraft industry. East Coast manufacturers are challenging the prewar monopoly on transport aircraft held by the West Coast. British plane makers are aggressively vieing with our industry for world markets. Top aircraft executives are seeking ways to turn excess working capital into future earning power. And everyone waits while Congress ponders future air policy. Developments of the next few months will set the pattern for the next two or three years.



Canada's Air Industry Is Really Ready for Business

By **JAMES MONTAGNES,** *Canadian Correspondent, "Aviation"*

Backed by extensive wartime experience, the Dominion's plane makers are now well started on peacetime production. They plan to tackle all phases of the industry—from design to manufacture, and aim is to compete in international as well as domestic markets.

POSTWAR PLANS of the Dominion's aviation industry are being sparked with a notable spirit of enterprise, present plans calling for a practical and profitable utilization of the country's broad wartime experience. Intention is to build aircraft not only for home use by transport operators and private flyers, but also for export to Latin America and the British Commonwealth.

During the war, Canada's airplane industry turned out all types of training and combat craft, from single-engine planes to the largest four-engine craft made in the British Commonwealth. Prior to the war, Canadian manufacturers had made only a few single- and twin-engine types of aircraft.

Peacetime production of aircraft in Canada has already started with a number of single-engine lightplanes and transports and also government-made four-engine craft for transport lines and for export. Some designs of new types are already on the drawing boards, and there are a number of companies which will shortly get started designing civil and military craft expected to be built in Canada.

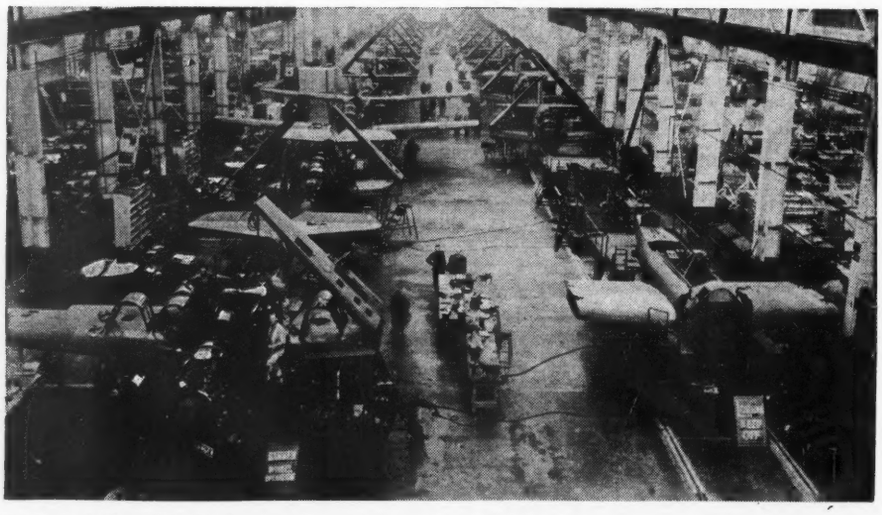
Design and manufacture of military aircraft in peacetime is a new field for the Canadian aircraft industry. Prior to the war, components of some British-designed planes were brought over and assembled at various Dominion plants. The RCAF has now announced that military craft will be designed in the Dominion, considerable research carried on for military purposes on jet propelled planes, and some manufacturing of new Canadian designs done to keep Canadian military aviation up-to-date. Specific data is not available as to types of craft already designed but not yet in production.

Canadian production of transport planes is now being paced by the government's wartime-built Canadair Ltd., at Montreal, where orders for Douglas DC-4s and C-54Gs are now being executed. The government has arranged with Douglas for the manufacture of these planes in Canada and for their export within the British Commonwealth in competition with the American-built units. Seventy C-54Gs are being built for the RCAF's transport division, and it is understood that 50 DC-4Ms are being fabricated for the government's Trans-Canada Air Lines—for its domestic services as well as its Canada-U.S., trans-Atlantic, West Indian and Latin American, and trans-Pacific routes.

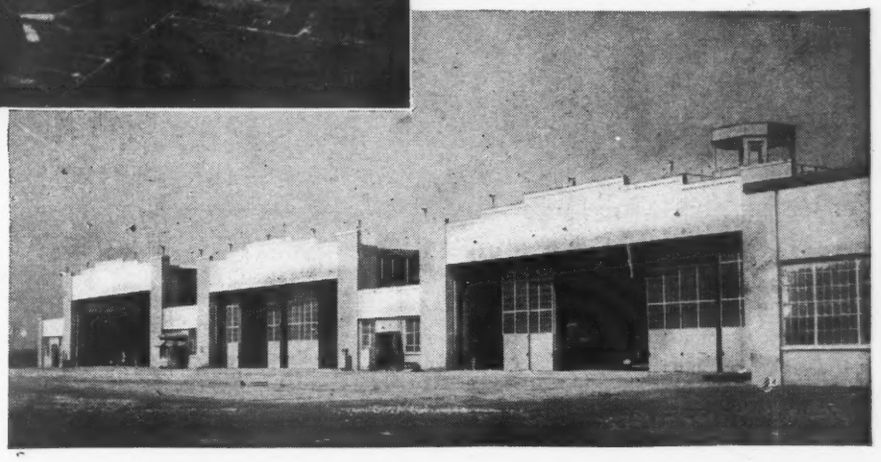
Before the war Canada would have imported such aircraft, but the industry created during the war has developed manufacturing skills and techniques enabling production of these planes in Canada on a competitive basis with the industry in the U. S. or Great Britain. Also, the aircraft industry is being kept in a production status, and while no actual comparative cost figures are available, some operation figures given recently to Parliament by TCA President H. J. Symington, are of interest in this connection. He pointed out that the Lockheed Constellation costs $775,000 in the U. S., and when this plane is imported, duties, exchange, and additional heating equipment bring the cost in the Dominion to $1,262,473. This, he declared, means that Canadian operators would have to write off annually $124,732 more than the operator in the U. S. using the same type of craft.

With plans to make Avro Tudors, the government's Victory Aircraft Ltd., at Toronto—built to manufacture the Lancaster and, later, the larger Lincoln four-engine bomber—has been sold to the Hawker Siddeley interests of England, designer of these planes. Accordingly, A. V. Roe Canada Ltd. has started retooling at the Toronto plant. Before being sold, the plant had also turned out converted Lancasters, with seating for ten passengers and considerable cargo space, for TCA's trans-Atlantic service.

A clause in the terms of sale of Victory Aircraft to A. V. Roe Canada Ltd., requires the new company to design and



Typical of Canada's facilities for peacetime plane production is this Fort William, Ont., plant of Canadian Car & Foundry Co. Ltd., portion of which is seen here during wartime assembly of Curtiss Helldivers.



Left: Another example of Canada's aircraft manufacturing facilities—de Havilland Toronto plant where Fox Moth is now being made. During war, Mosquito bombers and fighters were built here and test-flown from extensive runways. Below: Portion of hangars at A. V. Roe Canada Ltd.'s Toronto plant for manufacture of Avro Tudor and jet military craft. Lancaster and Lincoln bombers were wartime planes fabricated at this site.

build new types of aircraft in Canada. A. V. Roe has stated that it will build aircraft to sell not only in the British Commonwealth, but also to compete in the U. S. transport field. It will also build jet engines and military aircraft.

At Montreal, at least two other companies will build aircraft—in fact, have already started. Noorduyn Aviation Ltd. has started production on an improved model of its Norseman single-engine transport for six or eight passengers. This plane, popular in Canada—especially for northern bush and lake operations—was built during the war for the USAAF as a transport and ambulance plane, the UC-64.

At its Montreal plant, Canadian Car & Foundry Co. Ltd., is building the Burnelli CBY3 flying wing, a twin-engine transport with 20-ft.-wide fuselage to seat 24 passengers and carry 700 cu. ft. of cargo. Latin-American operators such as TACA have shown an interest in this craft.

Currently building pre-fabricated aluminum houses, Fairchild Aircraft Ltd., Montreal, had not, at this writing, announced any plans for manufacturing aircraft; its aviation work is now concerned with conversions and servicing.

At Toronto, de Havilland Aircraft Co. of Canada, Ltd., has started production on its prewar Fox Moth, single-engine four-place cabin craft, for the British Commonwealth market. A postwar lightplane is understood to be in the design stage, and whether a twin-engine craft similar to the prewar Dragonfly is to be built, has not yet been announced. It is not expected currently that the express transport version of the Mosquito, being built as the Dove by the British company, is to be built in Canada, as was the Mosquito during the war.

At Hamilton, Ont., Cub Aircraft of Canada has started production of its prewar J-3 tandem trainer, expects to build some three- and four-place Cub Cruisers, and may build the single-seat Piper Skycycle. No Canadian-designed planes are expected to be built there.

A new Canadian-designed lightplane—the Canuck—now coming off the production line at Fleet Aircraft Ltd., Fort Erie, Ont., is a two-place craft in which visibility has been stressed. The company plans to design several other personal planes, but no data has been announced.

At Edmonton, Northwest Industries Ltd. has started production on the Bellanca Skyrocket and Bellanca Aircruiser. The company holds licenses to build these two single-engine transports in the Dominion and sell them not only in Canada, but also in Alaska and for export. In the past, these planes have been used for bush flying operations in northern Canada.

No announcement has yet been made by Boeing Aircraft of Canada, Vancouver, as to its postwar plans. Part of its wartime-built plant has been sold.

During the war Canadian manufacturers became fairly self-sufficient in the production of instruments and parts, and many will continue to make or assemble these aircraft units. Similarly, propeller production was also developed in the Dominion during the war, with the Canadian government operating the plant. And Canadian Car & Foundry Co. Ltd. had designed a small transport propeller which is expected to be a peacetime industry product.

Canada has never produced any aircraft engines, but Rolls Royce of England announced recently that it had established a technical office and stores department for North America at Montreal, will service and overhaul its engines there, and may build and conduct research on its Derwent jet propulsion gas turbine unit in Canada.

All British and American engine manufacturing firms are represented in Canada with stores and service plants, mostly in eastern Canada, and one company has recently bought buildings at Vancouver to service its engines for western Canada.

In the prewar years, American and British airplanes were sold in Canada through distributors or dealers. Also, engine manufacturers, and other suppliers of the aircraft industry, had their representatives in Canada. Now more American and British plane manufacturers than in prewar days are endeavoring to sell in the Canadian market to private flyers, transport operators, and mining exploration companies operating in the northland. Freight-carrying planes are being advertised by many foreign manufacturers.

Annual average output of planes during the five years up to 1939 was about 40, and only about 1,000 workers were employed. During the war, the industry greatly expanded, and at peak more than 120,000 people were engaged, with annual production being about 4,000 planes. When V-J Day came, Canada had produced over 16,000 aircraft of all types—from single-engine trainers to four-engine Lancaster bombers.

Included were elementary trainers, such as the DH Moth, Fleet Fort, Fleet Finch, and Fairchild Cornell; advanced trainers, such as NAA Harvard and Avro Anson; the General Aircraft Hot-

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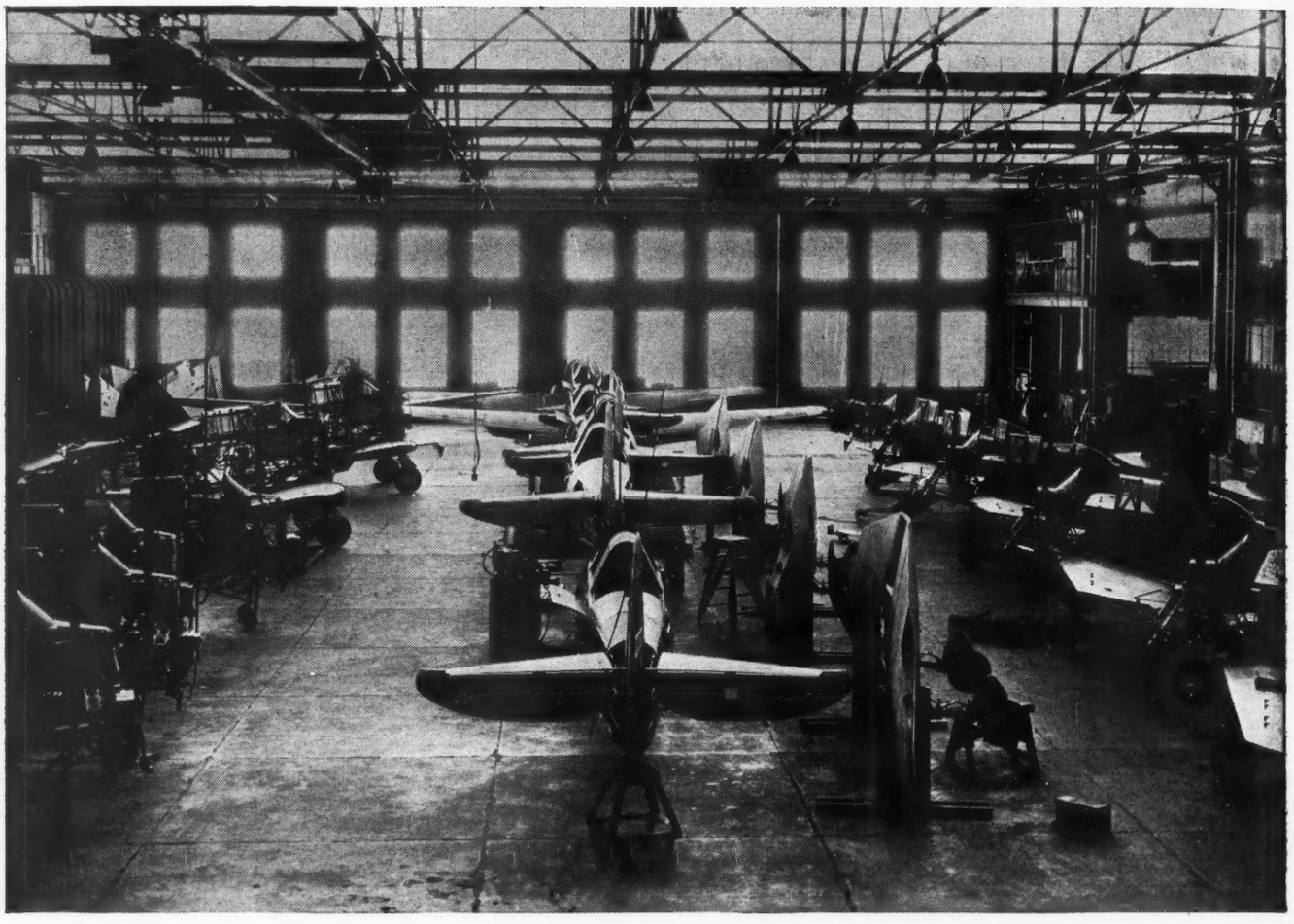


Main assembly floor at Commonwealth Aircraft, where Tudors will shortly be coming off the line. Snapped during war, this photo shows final fabrication of Wirraways.

AUSTRALIAN AIRCRAFT BUILDERS PRIMED FOR SALIENT ROLE

By H. BOWDEN FLETCHER, D. F. C., *Australian Correspondent, "Aviation"*

HAVING SPENT millions of dollars to establish an aircraft industry during the recent war, the Australian Government now intends to maintain the headway it has gained. It will continue to manufacture aircraft both for the RAAF and for private and commercial use.

Thus the industry will also be kept active so that, should the dogs of war again be let loose, this country will not be caught flat footed as it was in 1939. At that time, no up-to-date Australian aircraft were available, hence we were entirely dependent upon the factories of Great Britain and America. We had to take—and be content with—whatever equipment those countries could spare from other commitments.

There are two sections comprising our industry—the plants of private enterprise and those owned by the government. Representing the first named are Australia deHavilland and Commonwealth Aircraft Corp., while government interests are under the Aircraft Production Commission. Associated with both sections are a host of subcontractors, most of whom are now reverting to their own prewar industry in the new peacetime program.

Construction had been confined to the Mosquito, by deHavilland; the North American designed Mustang, by Commonwealth; and the long-range, 4-engine Lincoln bomber, by the Commission. The latter also was producing Pratt & Whitney designed Twin-Row Wasps at the Sydney factory.

In the postwar plan, envisaged by the government, the organization built up during the war will be retained to

With its aviation plants in good trim after the grueling war-order days, the "Down Under" industry is now putting broad plans in motion for an essential peacetime output. Military as well as commercial planes and engines will be made—meaning that Australia will maintain its new air power against any future war emergencies.

fulfill the following building projects:

DeHavilland will provide the RAAF with fast twin-engine fighter-bombers and will also be free to produce company-designed civil aircraft.

Commonwealth will provide single-engine fighters and also assist in assembly of big bombers and possibly passenger airliners.

The Commission will concentrate on long-range bombers of the Lincoln type, production of which was scheduled to reach one per day early in 1946. The large civil liners with a capacity of from 20 to 60 passengers will also be built by the Commission, and production of Avro Tudors is to be commenced immediately.

Since major types now being produced are powered by Rolls Royce, the engine factory in Sydney has been tooled for these power plants under license from the English company.

No extension of existing factory space is necessary, because present capacity was based on a peak war output and is therefore ample to cope with peacetime demands.

Negotiations are progressing for the building of both service and civil aircraft for use in Southwest Pacific areas, under an allotment to Australia in accordance with the empire scheme of decentralized production.

Success of the negotiations will depend upon the ability of Australian industry to produce aircraft at prices that will compare with those quoted by firms in Britain and America. This condition will mean a big reduction from wartime cost, which—although exact figures have not been published—is generally believed to have been very high. Drafters of the annual report to Parliament made caustic comments on what they considered to be a lack of anything like an efficient cost system in the department of aircraft production. There are those who feel that the Government would be impolitic to permit publication of the actual figures, argument being that with an election due about the middle of 1946, it would not be sound strategy to release such cost data unless they are favorable.

Total war production may not look big, when compared with American and British output; but considered in view of Australia's overall war effort, pride can be taken in the following figures:

1,070 Tiger Moth elementary trainers
90 DH Dragon transports
703 Wirraway intermediate trainers
250 Boomerang interceptors
700 Beaufort torpedo bombers
300 Beaufighters
1,300 Gipsy Major engines
700 Single-Row Wasps
1,000 Twin-Row Wasps

This sums to a total of 3,033 aircraft and 3,000 engines, to which must be added a considerable number of Mosquitos and Mustangs, actual figures for which have not yet been released.

Nationalization of Interstate Airlines will provide the government factories with a steady market for large passenger air liners, even though costs may be higher than elsewhere. This nationalization is part of the government's postwar plans to foster the construction program. In this connection it is interesting to remember that Australian National Airways had ordered about $6,000,000 worth of Douglas aircraft from America.

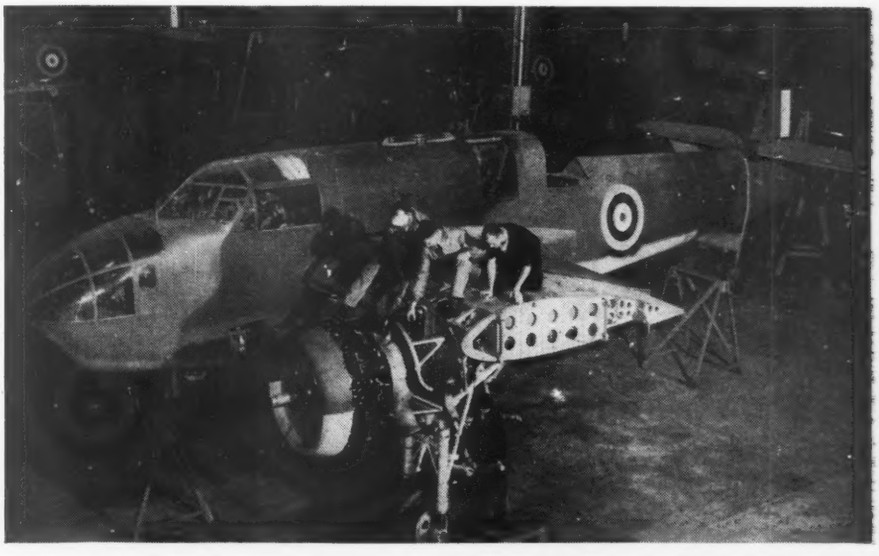
A provision in the Nationalization Bill permits losses, incurred in opening or running a route at the direction of the Minister, to be paid out of public funds by the Treasurer. High aircraft cost means high running cost which, when added to government overhead, makes it appear to the opposition that, under this ruling, it should not be long before the Treasurer will be subsidizing all the routes in operation.

No definite plans had been announced at this writing relative to the production of training aircraft and those planes suitable for the private pilot (2- to 4-place types), but the general opinion is that these will be left to private enterprise, and it is quite certain that deHavilland will be in this field.

American light aircraft, which were gaining in popularity in prewar days, should find a ready market, provided manufacturers realize that the power plants must be suitable for take offs when air temperatures run between 100 and 120 deg. F.—a high heat which is not unusual here in midsummer. Some of these light aircraft have been grounded for days waiting for the weather to cool off. It must be remembered that the private pilot expects to go places when the idea strikes him, and not merely when the weather is cool enough for his engine to get him airborne.

The Aircraft Production Commission has announced that fabrication of Beaufighters has now ceased. This stoppage caused immediate dismissal of several hundred employees, and it is expected that final retrenchment will push the figure to about 3,000. Production of Lincolns will continue without interruption, and the schedule for the output of Tudor commercial liners will proceed.

There is no doubt that Australia could produce the 60-passenger Tudors for less than $325,000 and that the peacetime industry accordingly would give permanent employment to some 10,000 workers. Jet-propulsion trainers, fighters, and bombers, together with transports powered by gas turbines, should be produced in Australia within a very few years.



This factory in Victoria is now being reconverted to peacetime aircraft building. Plant is seen here during wartime construction of Beaufort torpedo bombers.

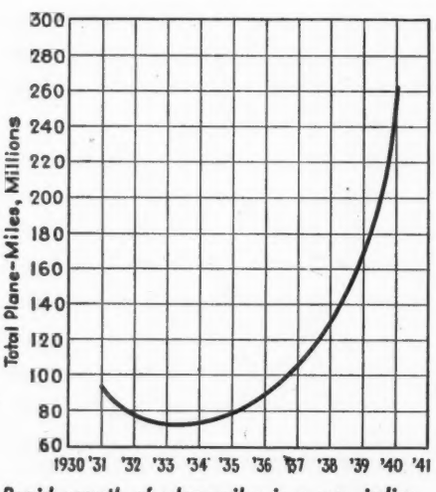
It'll Pay You to Promote LIGHTPLANE INSURANCE

By R. L. TEMPLETON, *Aviation Insurance Consultant*

Now that personal flying is perking, more and more questions will be coming your way concerning that very important "abstract accessory"—aviation insurance. And since "insured planes insure the business," you'll want to put power in your answers with the following facts. Indeed, you can go further and "stock" these policies as a profitable airfield sideline.

INSURANCE selling differs from other forms of merchandising because here there is nothing tangible to sell—you're merchandising *protection*. This abstraction does not make the sales job any easier. However, such condition is ameliorated because no stock need be carried, serviced, or guaranteed.

Moreover, it may be said that in any purchase it is potential benefits which are bought, and in this case the buyer knows beforehand exactly what performance he is to get. This last is the key to the whole deal of selling insurance—that is, the salesman is able, previously, to describe in minute detail the specific benefits of what he sells.



Rapid growth of plane-miles is a sure indication that a profitable market for lightplane insurance is waiting for the man who knows how to sell this service.

Whether you're merely advising or actually selling, these factors are pertinent when Plane-Owner Smith queries you.

NAA, in 1944, reported that insurance premiums were 30% of all costs in operating a lightplane. These premiums seem high, but one who knows how to sell insurance can show that the benefits outweigh the costs. The point is that no operator can intelligently and economically insure a plane until he understands exactly what he is selling.

The two main types of aviation insurance needed by your average plane-owner customer are: (1) Aircraft "hull" insurance, which indemnifies him against damage to the plane; and (2) "liability" insurance, which indemnifies him against liability for injuries to passengers or third persons outside the plane, or for damage to property caused by the plane. In this article, we are concerned with the former type (a separate article dealing with the latter is in preparation). Aircraft hull insurance is by far the most important as well as the most complicated of the two types. The importance of hull as compared with liability insurance is shown by the fact that in the last five prewar years (1937-1941) over $15,000,000 in premiums were paid for non-airline hull insurance, whereas less than $5,000,000 in premiums were paid by that class for liability insurance during the same period.

Insurance which protects your customer against damage to the aircraft itself is called "hull" insurance because the first aviation insurance was written by marine underwriters, and the terminology has continued to be similar to that of marine policies. Hull insurance includes the airframe, engines, accessories, and extra equipment.

Before considering the advantages and costs of the different types of hull insurance, there are certain facts about civil aviation which your plane-owner customer should note. To understand his need for insurance against damage to his plane, tell him what happened to private plane owners and their craft in a typical prewar year:

In 1939, out of a total of 5,515 private planes in service, 1,133 were involved in accidents. Every fifth plane flown by private flyers was involved in an accident of some kind. To go a little further and show how bad those accidents were, tell him to consider that of all accidents in 1939, 16.6% were "washouts," 32.7% required an overhaul, and 43.5% required a major assembly. Finally show him the figures on what happened to the people who were involved in those 1,133 accidents: Briefly, 9.2% were killed, 5.8% were seriously injured, 9.8% suffered minor injuries, and 75% suffered no injuries.

From this short summation, your patron can see that the flyers themselves got off pretty lightly, not much worse than automobile owners—but the planes took an awful beating.

Point out to your prospect that damage insurance varies in cost according to the extent of coverage included in the policy. Different degrees of coverage are available, and the more complete the coverage, the higher the premium will be.

Aviation underwriters offer different coverages, but there are three which are typical in hull policies. In every policy the premium will be either large or small (either around $70 or around $250 for a $2,000 lightplane) depending on whether the coverage includes crash damage. Coverage against crash damage, if bought by itself, on a $2,000 lightplane would cost $180, so that in

any policy written on such a plane the premium will be $180 more if crash damage is covered than if it is not.

The three hull policies referred to are: (1) Complete coverage (on a lightplane valued at $2,000) protecting the owner against all risks of loss, including crash and fire following crash, and costing $250, with a participation clause; (2) less complete coverage (for the same plane) protecting the owner against all risks of loss, except crash, and costing $70 with a deductible clause; and (3) still less complete coverage (Named Perils), protecting the owner against usual risks to which a plane is subject while not in flight (such as windstorm, taxiing collision, mooring, storage, theft, and fire), and costing between $50 and $70, depending upon the number and nature of the risks stipulated.

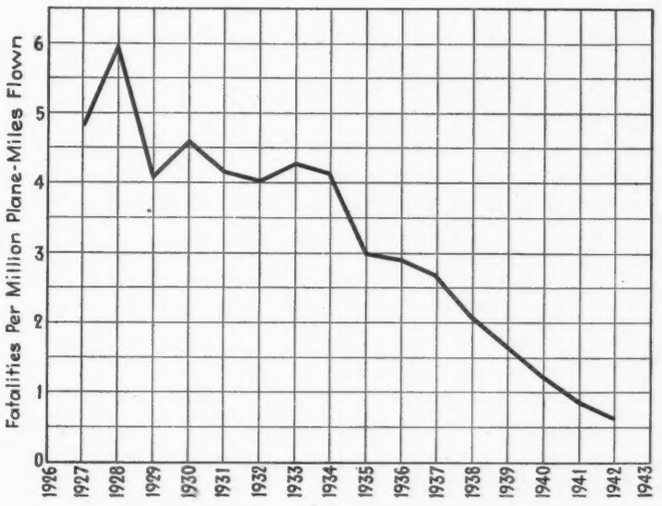
Other Rate Factors

Your plane-owner prospect should now have a general idea of the costs of various types of hull coverages, but there is some further information which you should divulge before pressing your sale. He should be made to understand why some aircraft get lower insurance rates than others. The exact premium does not depend upon the coverage alone. Besides the extent of coverage, the insurance rate on a particular plane depends upon many factors, such as its weight, whether it is private or commercial, new or used, and whether it is to be used for student instruction.

Lightplanes weighing under 2,000 lb. constitute a separate classification and are charged a slightly higher rate, because they are more fragile than the heavier planes and are so frequently flown by a beginner, whereas heavier planes seldom are. Complete hull coverage on a $3,000 private lightplane would cost $375, whereas complete hull coverage on a heavier private plane of the same value would only cost $315, which illustrates that although the planes may be of the same price there still may be a $60 difference in the insurance cost, depending upon the weight.

Another rule that your prospect should remember is that commercial planes used for student instruction carry a higher premium than others. It would seem that a commercial lightplane which is used for student instruction is the most expensive type of non-airline plane to insure. All commercial planes generally carry a higher rate than private planes.

Since many are now buying war surplus planes, it should be understood what effect their "secondhandedness" has upon the cost of insurance. New planes may be insured for full cost price; used aircraft for current market value. And the cost or value (if it is a used plane) should include the cost or value of all extra equipment. After plane models have been classified, each is assigned a basic premium rate, and a new plane will be insured at this basic rate. If it cost $2,000 and has been given a 12½% basic premium rate for complete hull coverage, the annual premium will be $250. But if it is a used plane, a "loading" rate is added to the basic rate. If it originally cost $2,000 but is currently worth only $1,000, it would have a loading rate of 3.12% added to the basic rate of 12½% so that the annual premium for complete hull coverage would be $151.20.



With fatalities dropping to 0.7% from former figure of 6.0% per million plane-miles, lower premiums should make aircraft insurance easier to write as number of prospects multiplies.

A loading rate is added to the basic rate, when a used plane is insured, in order to offset depreciation. There is a mandatory depreciation provision in all policies that in event of a *total* loss the aircraft value shall be depreciated 20% annually if it is a new plane and 15% annually if it is a used plane.

However, *partial* losses are paid without any deduction for depreciation, and for that reason the loading rate must be added to the basic rate when a used plane is insured. When there is a partial loss to an insured used plane, the insurance company pays the cost of new parts without deduction for depreciation on the parts replaced.

The last hull insurance complication which you should unravel for your prospect concerns deductible and participation provisions designed to impose part of the losses upon the plane owner so that he may, in return, get lower rates.

In the hull coverage examples, the participation clause was in policies where coverage included crash risks, whereas the deductible clause was in the policy which did not cover damage caused by crash. Difference is that participation charges a certain percentage of all losses on the owner regardless of how great or small they may be, whereas with the deductible clause the owner pays all losses under $50. The participation clause is better than the deductible where small damage is incurred, but not in an instance in which an extensive amount of damage is sustained.

The deductible clause provides that the insurance company will pay only for that part of the loss in excess of the deductible amount — usually $50, or 5% or 10% of the insured value of the plane. An important thing to point out about a deductible clause is that when it is used the plane owner, and not the insurance company, will pay for small damage to the plane. For instance, if there is 5% deductible on a $2,000 plane the insurance company would be liable only for that part of any loss which is in excess of the sum of $100.

Participation is usually found in policies which cover crash damage. This clause imposes upon the plane owner a certain percentage of all losses no matter how large or small, the exact percentage depending upon the number of flying hours of the pilot, as follows:

Private pilot with 200 hr.....20%
Private pilot with 100-200 hr.....22½%
Private pilot, less than 100 hr.....25%
Student pilot 27½%
Plane used commercially.....33⅓%

Here's the best advice you can give your patrons concerning hull insurance: Buy the policy while your plane is in good shape and will get a favorable rating. If nearing 100 or 200 hr., take out your policy after you pass the 100 or 200 hr. mark so as to get the best participation percentage and the most protection for your money. Always buy the type of coverage you can best afford. In short, if you find $250 too "steep" for complete hull protection on a $2,000 plane, then the next best thing is to pay $180 for protection against crash damage alone. If you can't foot that bill, you should pay $70 for protection against all risks of damage except crash.

Finally, if your customer says he can't afford even that $70, you better tell him: "In that case, Mister, you can't afford to fly."

First Step is Choosing The RIGHT Business Setup

PART I OF A SERIES

By **CHARLES A. PARKER,** *Major, AAFATC, Retired*

Detailed here are those pertinent "why" and "why not" organizational factors which the prospective operator should carefully consider before launching his airfield enterprise . . . First feature in a new group of practical "how-to" articles dealing with efficient formation, precise systematizing, and profitable operation of an airport flying service.

PATH OF SIMPLICITY, if you're promoting a new aviation business, is to merely select a firm name, print some stationery, name yourself manager, and announce that the Smith Flying Service is now ready for customers.

But if it's success that you're after, there are certainly wiser ways to proceed. The flying business, like any other, is subject to a full round of vicissitudes, and once some of these are encountered, there comes quick recognition that the "just start 'er up" method not only leaves much to be desired but might even put you in a business ground loop.

Prime point here is that *type of organization* is the No. 1 consideration, experience having shown that this question should be very carefully resolved before any other action is taken or a single penny spent. Furthermore, the necessary system of records, financial and otherwise, should also be established beforehand.

In this initial article of our series, we shall briefly review the various types of business organizations and indicate their relative merits. Broadly, there are three forms of business setups from which the prospective operator may choose—individual enterprise, partnership, and the corporation.

Individual enterprise is the oldest and the most common, as well as the easiest to undertake. Its foundation requires only sufficient capital to get underway. And some of the advantages enjoyed by the individual who operates this kind of organization may be listed as follows: (a) He is subject only to the general laws of civil right; (b) he may hire whom he pleases and delegate authority as he sees fit; (c) close personal supervision of the business is possible; (d) he can indulge in any line of endeavor; (e) profits are solely his own; (f) he may terminate activity at any time; (g) he can work with great flexibility; and (h) his borrowing capacity is not limited entirely by the limitations of his business, but rather by the sum total of his property and the merits of his personal integrity and ability.

The individual in business carries all risks and gets all profits—but he also shoulders all liabilities, hence may lose everything he owns if the project fails.

Accordingly, the ease and flexibility of the individual enterprise cannot be denied. Its potential disadvantages, however, also warrant careful consideration.

They are: (a) The liability of the individual proprietor is *unlimited* and in case of failure *extends to all his personal property* whether or not it is part of his business, i.e., his home, furniture, etc.; (b) the life of the business is coexistent with that of the proprietor, and hence a great element of uncertainty is present; and (c) enterprises that later expand may demand an amount of new capital lying out of reach of the average individual.

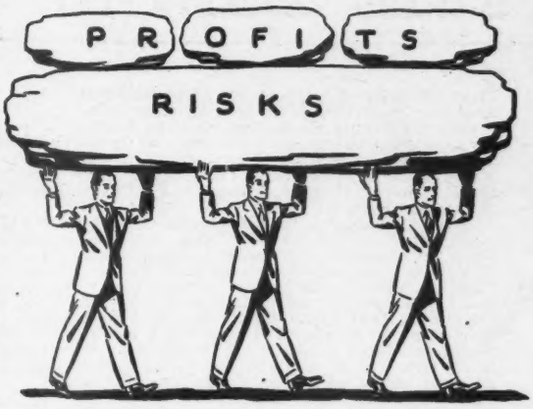
Principally, it is the matter of liability that is the factor to watch in this form of organization. You may find that the business you plan calls for a structure more staunch—less loose—than the individual enterprise represents. This may be particularly so when a venture into aviation is undertaken.

Partnership. Accordingly, the operator may find it desirable to have others associated with him as partners—perhaps mens who have the needed capital, or in lieu of capital, certain rights, knowledge, or skill. In this event the promoter may look to the partnership as the logical manner of establishing the enterprise. Two or more persons can make up a partnership by a purely verbal agreement—or better still a written agreement—called Articles of Co-Partnership, where the rights, responsibilities, and obligations of the combine will be legally defined. In some states it will be necessary to file such an agreement.

It must be realized that *a partnership is not a legal entity* and hence it can not

sue or be sued as a firm. Legal responsibilities fall upon individual members and suits can be brought upon them jointly and severally.

Other disadvantages are as follows: (a) It may be difficult to secure harmony among the partners; (b) acts which one member commits in the name of the firm bind all members, and every debt incurred on behalf of the company is the debt of all jointly and severally, and, as in the case of the individual enterprise, extends to each partner's private fortune as well; and (c) individuals involved are thus bound, since no partner may withdraw without the consent of the other partners. It is also difficult for parties to transfer interests.



A partnership divides profit—but any one partner may have to carry all debts if others cannot meet them.

The partnership, however, does have some advantages: (a) It is easy to form; (b) it is unrestricted in its activity or in the number of enterprises it may engage in; (c) it is relatively free from regulation in some states; and (d) it can act with reasonable promptness and work with nearly the same freedom as an individual in the transaction of its business.

We may point out, however, that the partnership form has declined in favor. The matter of liability is hardly attractive, and many hold that disadvantages of partnership quite overweigh its advantages. The corporate form of organization therefore may well be the operator's choice.

The Corporation: Basically, the corporation is is an artificial person created via law to act for some specific purpose. Corporation rights and privileges vary to some extent in different states. As an artificial person it can sue and be sued, but here legal action ends. This is a very important consideration.

In most states, formation of a corporation requires three or more persons. First, the promoters of the venture file a Certificate of Incorporation with the state authorities. This paper contains such information as: Name of the company; purpose for which the company is being formed; total amount and nature of the stock; names and addresses of the stock subscribers and number of shares taken by each; location of the principal place of business; and number, names, and addresses of the directors.

The state with whom the application is filed then issues a charter authorizing the organization to engage in the proposed business. A set of by-laws governs the directors and officers in carrying out the functions of the company.

The executive setup of the corporation includes a president, treasurer, and a secretary. Vice-presidents may be included. These officers are elected by the directors who have the responsibility of managing the corporation. In small organizations the three officers will probably be the entire directorate.

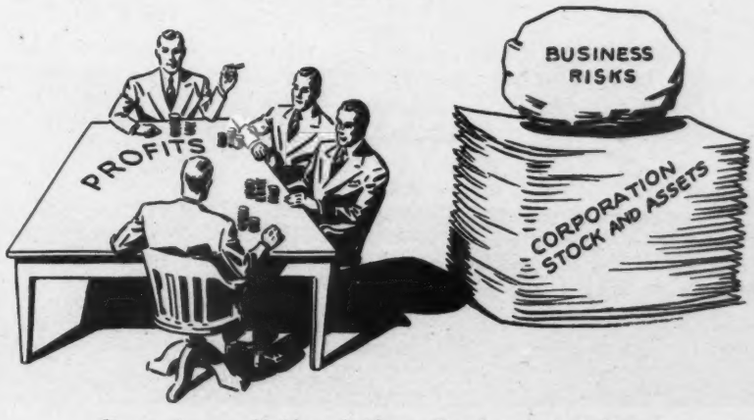
Any corporation issues stock. It represents the investment held in the company. There are two principal forms:— (a) Common Stock: This is the ordinary stock of the corporation. It has voting power but it has neither special privileges nor restrictions. Common stock holders enjoy the rights to any profits but assume the major proportion of the risk of losses; (b) Preferred Stock: This stock does not represent ownership in the same manner that the common does, nor is the function of management usually granted its holders through voting power. As the name implies, it receives preference as to the dividends declared. Usually it also carries a preference as to the assets in the event the concern is dissolved.

Advantages of the corporation are several, these desirabilities being apparent: (a) The corporation carries limited liability, the stockholders being liable only to the extent of the amount of their investment, and they cannot be held liable for debts of the company beyond this; (b) an element of permanency accompanies the corporation, and it does not dissolve upon the death or withdrawal of any of its members; (c) transfer of stock ownership can be carried out without disrupting the organization; and (d) a large number of people can participate, increasing the availability of capital.

Disadvantages of the corporate form are as follows: (a) Greater organization cost is entailed, fees are charged for recording and filing papers, legal and notaries' fees must also be paid, and states usually require a fee on the issuance of the charter, while a tax on the capital may be made at the outset; (b) corporations are subjected to restrictions imposed by the State and Federal Governments, and they must be formed for a specific purpose (though the average charter can be written to include practically everything that the operator will ever be interested in doing); (c) reports must be filed and special records kept to satisfy government requirements; and (d) corporations have been subjected to increasing taxation.

The small operator who enters the aviation business and incorporates, will probably have a closed corporation, where the company is practically individually owned, a few shares being issued to members of the family, relatives, friends, or employees, who in turn serve as officers and directors. Here, probably not more than three persons will be involved. The proprietor, holding nearly the entire stock, manages the business almost as if it were an individual enterprise. He still, however, has all the benefits of the corporate setup.

In his second article of this series, the author will consider the means of systematizing operations.



Corporation stockholders divide profits, but stock and corporation assets are all that they can lose if things go wrong.

TAGGING THE BASES

Flying Clubs Make Big Gains

Striking evidence of the popular acceptance of the personal plane is the recent rapid increase in both the number and size of flying clubs.

It will be recalled that the enthusiasts of the '30s commonly turned to this type of organization because it offered a means to collectively purchase a plane for communal use, thus affording flying time at the least individual expenditure. But now there's a new note. Today's flying club is attaining a social status paralleling that of the yacht club—with plane owners banding to enhance their enjoyment in group activities.

This augmented flying organization is seen bringing personal flyers the same benefits which are enjoyed by the affiliated yachtsmen who, when cruising, are welcome guests at other clubs in any part of the world. It should not take too great an organizational effort to bring about similar customs and privileges for personal plane owners who belong to recognized flying clubs.

Notable step in this direction has been taken in Canada, where incorporation of the Royal Canadian Flying Clubs affords Dominion airmen a special organization for such activities. Starting with the original club at Oshawa, Ont., the group has now grown into a flourishing body comprising 28 affiliated clubs, and the prospects are good that this number will pass the 50 mark within the next six months.

Organization Hows and Whys

An excellent booklet *Flying Clubs, Organization, Management, Cost and Safety Rules,* has been published by Aero Insurance Underwriters, 111 John St., New York (7) N. Y. Sent to responsible persons on request, it is basic reading for flyers who are promoting the club idea.

First Region—A. Hyde of Congressional Airport, Rockville, Md., reports that Congressional Flying Club now has 120 members, with expectations of 200 by next summer. . . . Buffalo Aeronautical Corp., Buffalo, N. Y., Municipal Airport, is now agent and service organization for RCA aircraft radio. . . . Wiley Post, Jr., at A-B Airport, Allentown, Pa., has gone into the mail-order business, handling manuals, flight equipment, and pilot's accessories. This is a slant worth thinking about. . . . Cliff Leutholt of Columbia Aircraft Services, Bloomsburg, Pa., Municipal Airport, announces that a pre-flight class has been started at Bloomsburg High School among senior students. Joseph C. Gillespie, ex-B-24 pilot, is now flight instructor. . . . Atlantic Aviation Corp., Teterboro, N. J., Airport and Boston, Beech distributor, is now Bendix Flightweight Radio distribution and service agent for N. Y., New England, and Northern N. J.

Second Region—Hawthorne Flying Service announces that T. C. Hadwin, former AAF instructor, is now company's manager at Jennings Municipal Airport, Orangeburg, S. C. . . . Bendix Radio is now being distributed and serviced by the following companies: Southern Air Services, Memphis; Southern Airways, Atlanta; and Hawthorne Aero Supply, Orangeburg, S. C. . . . Southern Airways now has bases at Greenville and Camden, S. C., Charlotte, N. C., and at Huntsville, Birmingham, Mobile, and Decatur in Ala., in addition to Atlanta main base. Firm represents Piper, Taylorcraft, Beech, and Republic. . . . Southern Air Services, Sanders Field, Memphis, has erected a new steel hangar and has extended runway to 5,400 ft. Manager J. F. Lanier states that firm is agent for Piper, Beech, and Republic. . . . Marion Carstairs, former speedboat racer, has broken ground on Lummus Island, Fla., for a combined land and seaplane base, with yachting accommodations. Hangar space will accommodate 500 aircraft.

Third Region—N. M. Green, Greenville, Mich., Flying Service, reports that City of Greenville has purchased 160 acres for new airport one mile from city hall, in response to greatly increased flying activity in that section. . . . John and Emily Gottschalk, operating school of aeronautics at Adrian, Mich., have both been appointed flight examiners by CAA. Cold weather operations have commenced, with prospect of flying all winter. Students are passing tests at rate of four per week. Firm is Aeronca agent. . . . Anderson Air Activities, Gen: Mitchell Field, Milwaukee, reports that distribution of Bendix Flightweight radio will call for upward of 30 dealers in Wis. and Mich. upper peninsula. Ercoupe, Seabee, Fairchild, and Beech planes are also distributed by this organization. . . . Following firms are distributors for RCA aircraft radio: Aircraft Instrument Service, Detroit; Flight, Inc., Cleveland; Snyder Aircraft Corp., Chicago; Sullivant Airport, Columbus; and Van Dusen Aircraft Supplies, Minneapolis.

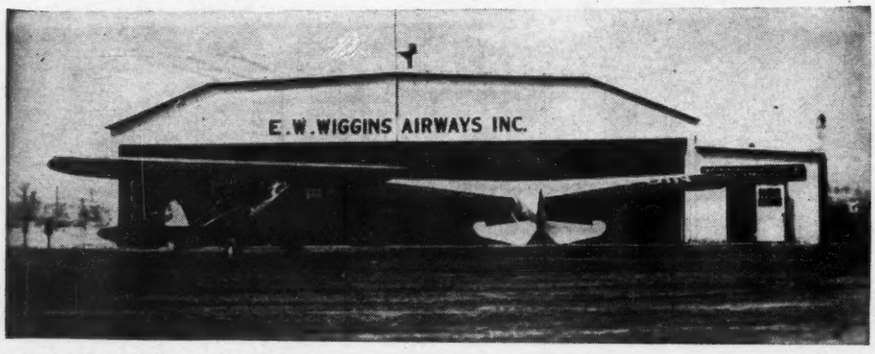
Fourth Region—Ragsdale Flying Service, Municipal Airport, Austin, Tex., also conducts Southwest Flight School at San Marcos, Tex., and Childress Flying School, Childress, Tex. These new CAA approved schools are receiving a large number of student applications. In addition to instruction, firm specializes in aircraft repair and is agent for Piper, Stinson, and Republic.

Fifth Region—Following firms are service and distribution agents for RCA aircraft radio: Pacific Airmotive, Kansas City, Mo.; St. Louis Flying Service, Lambert-St. Louis Airport; and Snyder Aircraft Corp., Denver. . . . Mitchell, S. D. Airport, recently opened, has two hangars, and there is a restaurant on field. Company is Taylorcraft, Lycoming, Continental, General Tire, and Heath agent. Field now has 60 students.

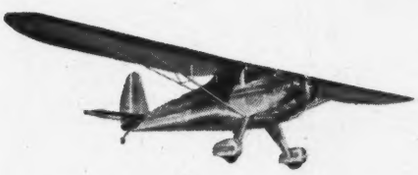
Sixth Region—Rankin Aviation Industries, Tulare, Cal., has ordered a Republic Seabee. Craft will be carried on deck by tuna clipper *Pan America,* for use as fish scout. . . . Arizona Aviation Service reports that 200 operators flew to Phoenix to discuss CAR changes with CAA Inspector Harold Bromley. . . . G & G Airlines, Gilpin Airport, Tucson, Ariz., recently converted a PT-17 Stearman for civilian use. It was purchased by Lt. Theo. Pratt, Jr., a B-17 pilot who learned to fly in the same plane when he was a student. Airport has purchased a 12 ft. Diesel-powered grader and is extending all three runways to accommodate largest planes. . . . Sky Harbor, Phoenix, has so much charter business that a 285 Beechcraft has been purchased to supplement two Cessna Airmasters. . . . Vail Field, Los Angeles, reports that following operators are now located there: Hank Coffin Air Service, Aeronca agent; Bob Crow's Aviation Service, charter and flight instruction; Brownie Roberts' Sky Store; Dennis Repair Station; Kirkorian Instrument School, hood and Link instruction; Airplane Sales Co., Bellanca dealer; and Robert Burke Flying Service. Field has paved runway and taxi strips, with oiled apron and tie-down area. . . . Sargent Flying School, Sargent Field, San Jose, Cal., Luscombe agent, has appointed Gordon N. Froisness operations manager and flight instructor. School recently trained 11 private pilots, 6 solo students, and 1 commercial licensee. . . . Kern County Pilots Assn., Bakersfield, Cal., now has 75 members and a well furnished club headquarters—plus a bank account. Flights have brought out as many as 29 planes and 64 pilots, a high percentage which augurs well for future popularity of this form of organization.

Seventh Region—Northwest Aircraft Distributing Co., Vancouver, Wash., announces that the following firms are now Taylorcraft dealers: In Wash., Lamb Flying Service, Spokane; Deer Park Flying Service, Deer Park; Lemon Aircraft Co., Veradale; Northern Aircraft, Seattle; Kurtzer Flying Service, Seattle; Ellensburg Flying Service, Ellensburg; Pullman-Moscow Air Service, Pullman; Aircraft Sales & Service, Tacoma; Central Aircraft, Tacoma; Forrest & Runyan, Vancouver; C. B. Scholl, Vancouver; Lind Flying Service, Lind; Coulee Dam Amphibious, Coulee Dam; Puget Sound Flying Service, Marysville; Longview Sky Harbor, Longview; and C. O. Hammontree, Bremerton. In Oregon: Burleson Flyers, Albany; Art's Flying Service, Grant's Pass; Eastern Oregon Airways, La Grande; S & M Flying Service, The Dalles and Beaverton; Coast Sales & Service, Seaside (Astoria); Hurrah's Taylorcraft Sales, Pendleton; Reed's Aircraft Sales, Eugene; Cy Walland Taylorcraft Sales, Klamath Falls; Piercy Flying Service, Medford; and Salem Flying Service, Salem. In Idaho: Buroker Hicks Flying Service, Coeur d'Alene; Howard Eaton, Emmett; Thousand Springs Airpark, Hagerman; Central Idaho Aircraft, Caldwell; Aircraft Sales Co., Idaho Falls, and Northwest Flying Service, Boise.

Canada—Chilliwack, B. C., Flying Club now has 120 members who have subscribed $25 each in dues. Other clubs formed or in process are: Penticton, B. C.; St. John, N. B.; and Whitehorse, Yukon. . . . Wilson & Danes of Edmonton have been flying freight 800 mi. north to Yellowknife Airport on a regular schedule all summer. . . . Northwest Industries, formerly Aircraft Repair, of Edmonton, Alta., has contract for building Bellancas for Canada and Alaska.



Metropolitan Airport, Boston, Mass., home base of Wiggins Airways. Company also maintains a base at Westfield in same State.



AVIATION'S 1946 Yearbook

OUR 13TH ANNUAL DIRECTORY presents through the Airshow in Print, engineering data on 57 American personal planes and helicopters now in production or under development, plus data on 28 American, British, and Canadian transports, and the latest American and foreign bombers, fighters, and guided missiles. . . . Altogether there are 210 engineering drawings and photographs covering 118 types. In addition, we publish the first turbojet specification tables, as well as AVIATION'S comprehensive tables on aircraft and helicopters.

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American, British, and Canadian Transport Aircraft 110–123
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American and Foreign Fighters 127–132
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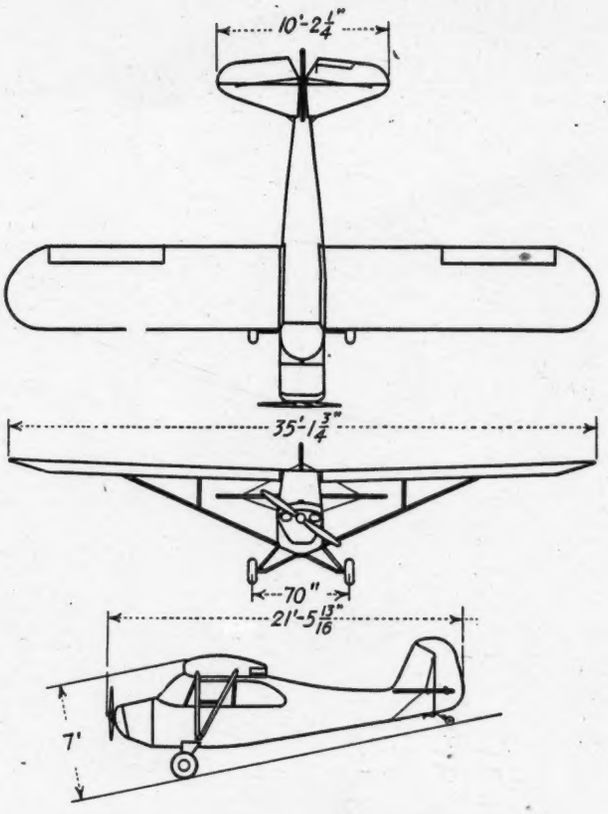


Aeronca Champion

Priced at $2,095, FAF, this is Aeronca's first postwar craft to go into production, and is now rolling off a mechanized assembly line. New comfort and safety features include one-piece formed windshield giving greater visibility; improved control system; simplified brake system; and built-in tie-down rings. Powered by 65-hp. Continental engine, it has top speed of 100 mph., and cruising speed of 90. Landing speed is 28 mph. With 15-gal. fuel capacity, cruising range is 270 mi. Landplane version has gross wt. of 1,220 lb., useful load of 510 lb., seaplane version, with same useful load, grosses 1,320 lb.

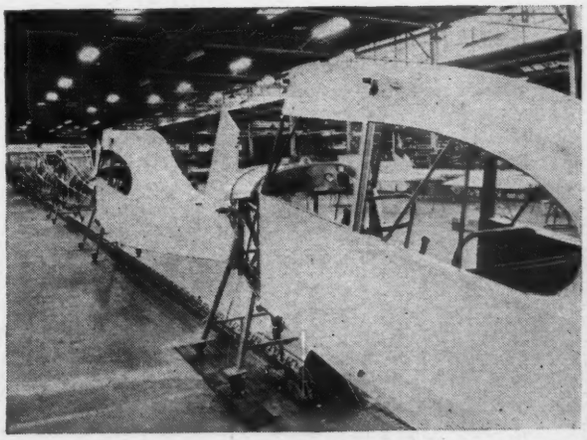
Al. B. Bennett, Dir. of Sales

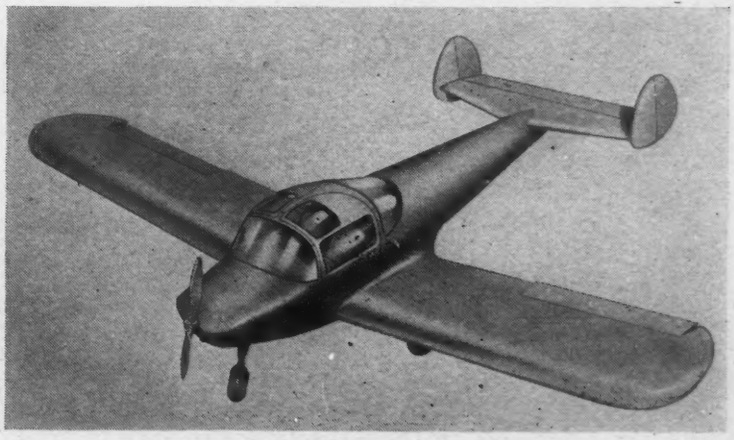
Aeronca Chief

New side-by-side seats are larger for greater cross-country flying comfort and lower cowling line gives added visibility. With 65-hp. Continental engine, high speed is 100 mph., cruising speed is 90 mph. and, with auxiliary tank giving 23-gal. fuel capacity, cruising range is 420 mi.

Aeronca Chum

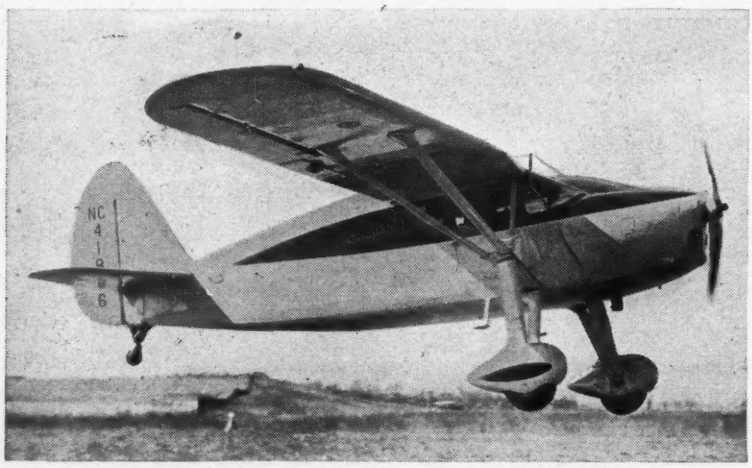
A two-control, spinproof design being readied for early production, this model will have 85-in. tread, tricycle landing gear, metal fuselage, and fabric-covered metal wings. Powered by 85-hp. Continental, it will have top speed of 120 mph. and cruising speed of 108. With normal fuel capacity of 23 gal. it is designed for 540-mi. cruising range. With side-by-side seating, it will have dual controls. Its useful load of 515 lb. includes provision for 70 lb. of baggage. Span is 28 ft. 8 in., length is 20 ft., and height 6 ft. 2 in. Total wing area is set at 140 sq. ft., giving wing loading of 9.57 lb. per sq. ft. Photo at left shows Champions on mechanized production line.

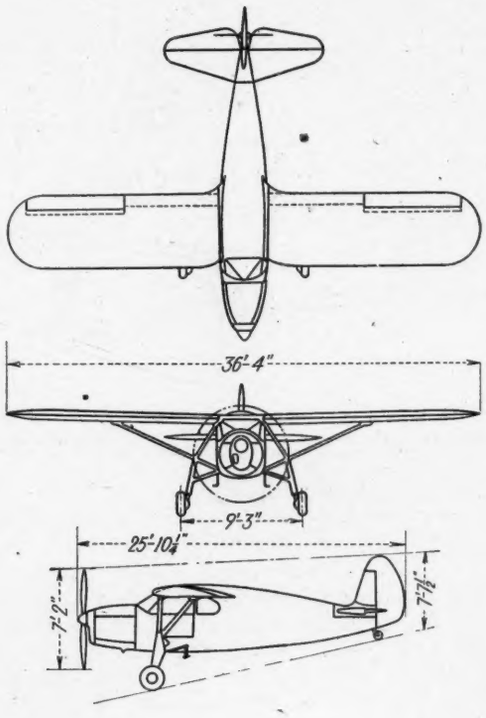




Fairchild F-24R

Priced at $8,875, this is an improved version of a prewar and military favorite. Powered by 175-hp. Ranger six, it has a high speed of 133 mph., cruising speed of 118 mph., initial climb of 650 fpm., service ceiling of 14,000 ft. and, with 60-gal. fuel capacity, cruising range of 620 mph.

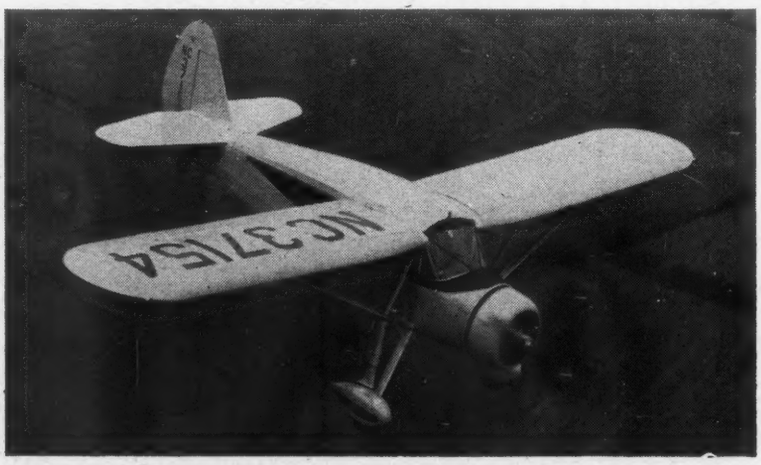


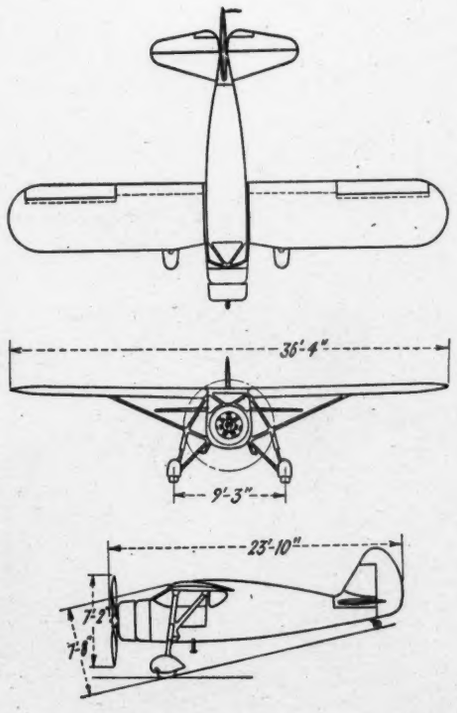


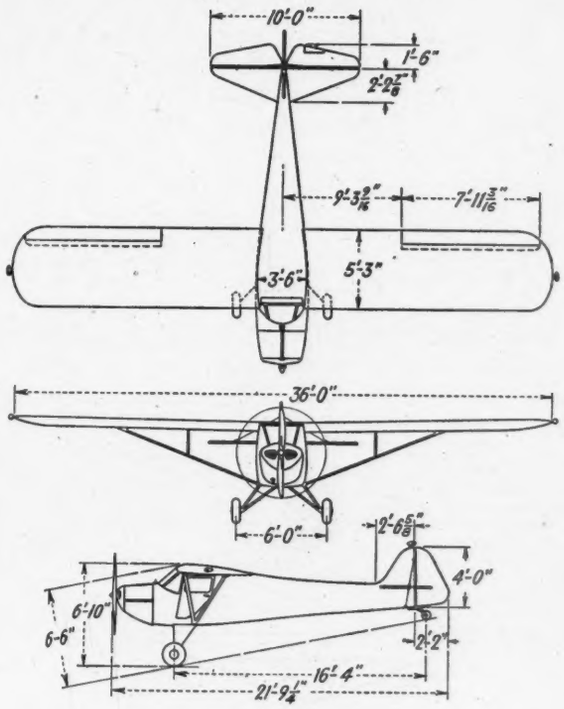
Lee H. Smith, Dir. of Sales, Personal Planes Div.

Fairchild F-24W

Powered by Warner 165-hp. radial, this version of the 24 retails for $8,500. Its performance is similar to the Ranger-powered version, except that high speed is 132 mph., cruising speed is 117 mph., and cruising range is 639 mi. Both versions have provisions for full blind and night flying and radio equipment.



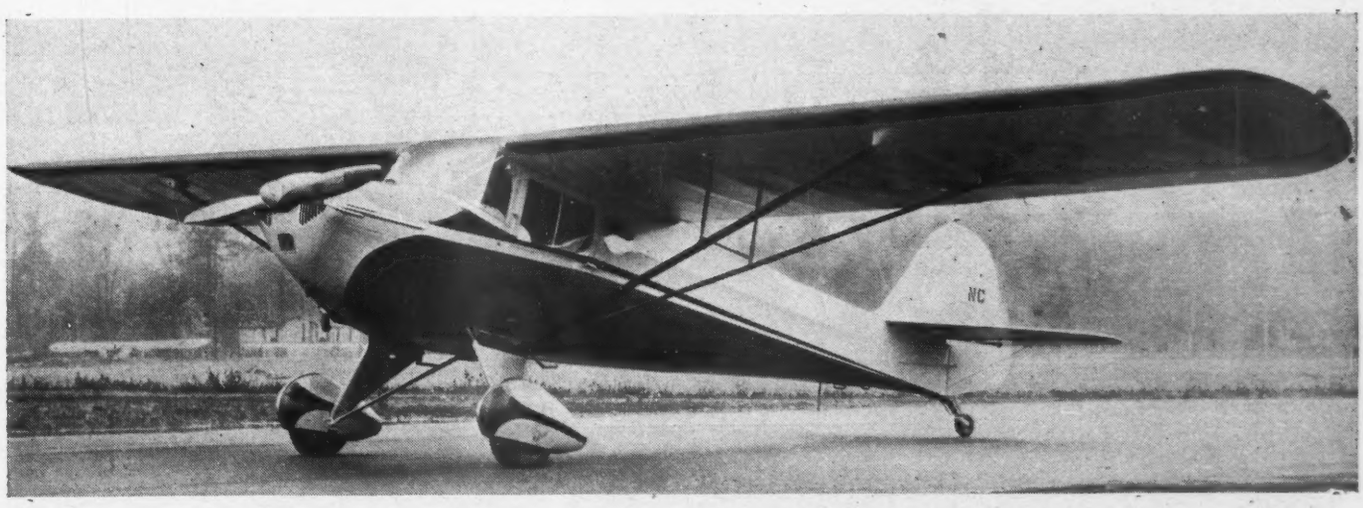




Taylorcraft BC12-D Deluxe

Basically the same design as the BC12-D Standard, this version is equipped with wheel pants, strut fairings and has added window just aft of door, in addition to more luxurious interior fittings. Increasing fuel capacity from 18 to 24 gal. gives it a cruising range of 504 mi. as compared with 378 of Standard.

Nash Russ, Pres. & Sales Mgr.



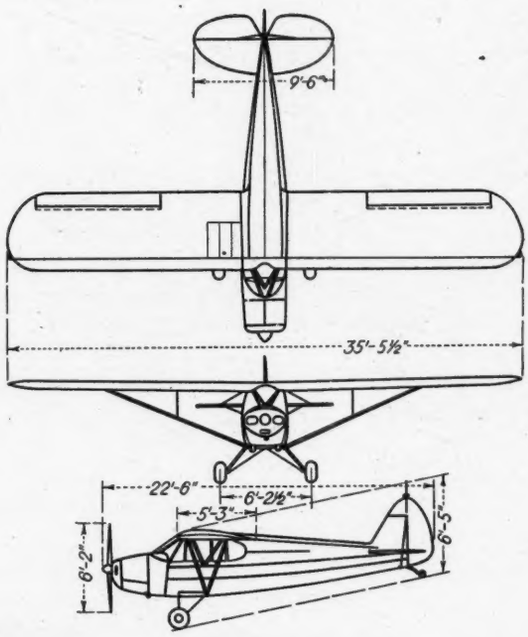
Taylorcraft BC12-D Standard

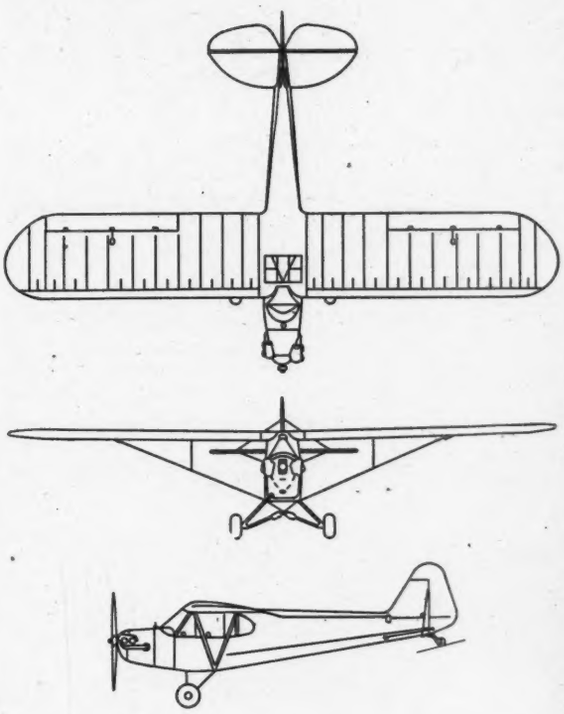
Two-place side-by-side seater powered by 65-hp. Continental engine giving sea level high speed of 105 mph. and cruising speed of 95 mph. Eighteen-gal. fuel capacity is adequate for normal cruising range of 378 mi. Initial rate of climb is 600 fpm., and service ceiling is 15,000 ft. List price is $2,295.

Piper Cub Super Cruiser

De luxe model of a famous line with standard equipment including electric starter, motor driven generator, 12-v. battery, navigation lights, muffler, cabin heater, indirectly lighted instrument panel, and provisions for blind flying instruments and radio. At 1,750-lb. gross wt. with 104-hp. Lycoming engine, it has takeoff run of 640 ft., top speed of 115 mph., cruising speed of 103 and, with fuel capacity of 38 gal., a cruising range of 600 mi. Strut-braced, fabric-covered wings have aluminum spars, nicral ribs, aluminum leading edge and wood tip bow. Fuselage is fabric-covered Warren truss steel tubular structure. Priced at $2,905.

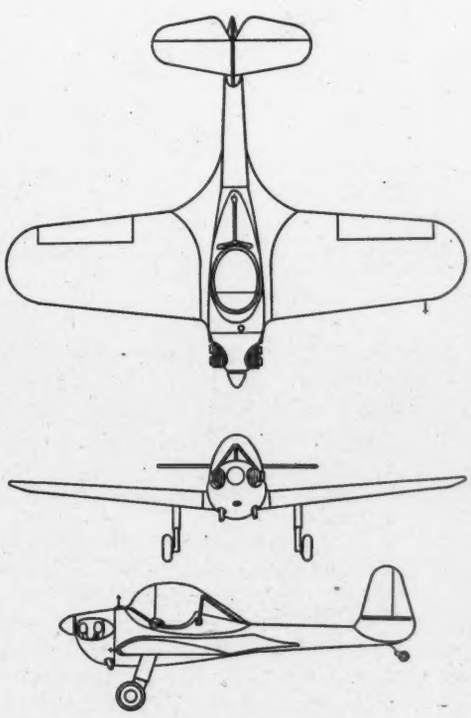
W. B. St. John, Sales Mgr.





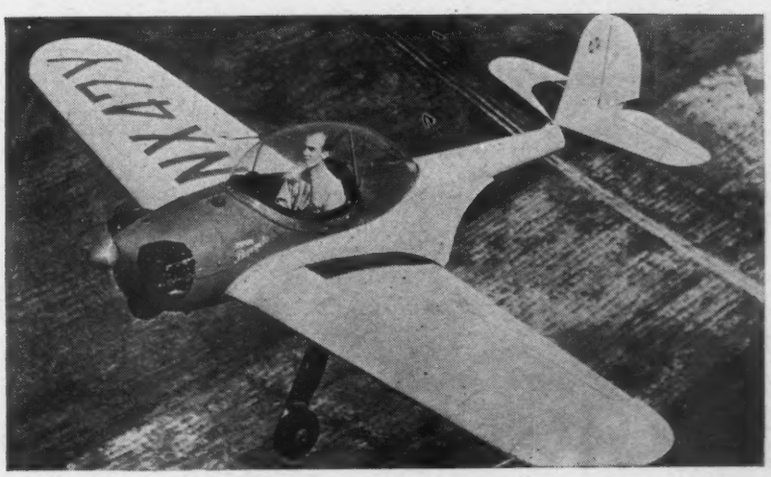
Piper Cub Special

Peacetime version of famed Army liaison plane now in mass production and retailing at $2,010 FAF. A 65-hp. Continental gives, at 1,220-lb. gross wt., high speed of 83 mph., cruising speed of 73 mph. and 450-fpm. initial climb. Twelve-gal. fuel capacity gives 200-mi. range. Landing speed is 39 mph.



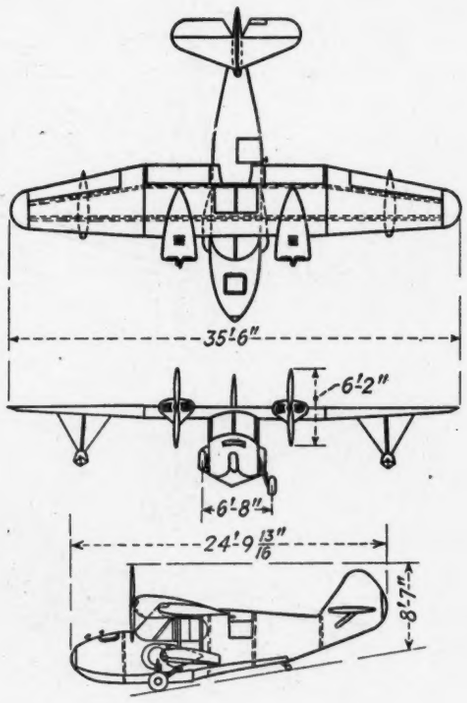
Piper Cub Skycycle

An experimental craft serving as flying laboratory to develop single-place plane to sell for $800-$1,000. Its 55-hp. Lycoming gives high speed of 115 mph., and cruising speed of over 90 mph. Cruising range on 14 gal. is 400 mi. Fuselage is aluminum monocoque and plastic construction.



Commonwealth Trimmer Amphibian

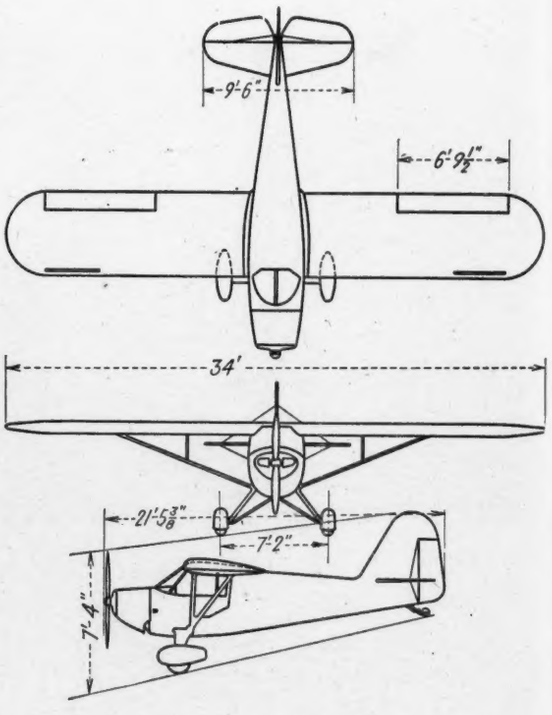
Three-place plastic bonded plywood amphibian listed at $5,985. Two 85-hp. Continentals give top speed of 135 mph., cruising of 115 and climb of 850 fpm. Landing speed with flaps is 47 mph., range is 500 mi., and 1,500-ft. ceiling can be maintained on one engine. (Also see detailed sketches on pages 163-165.)



John E. Cregier, Sales Mgr.

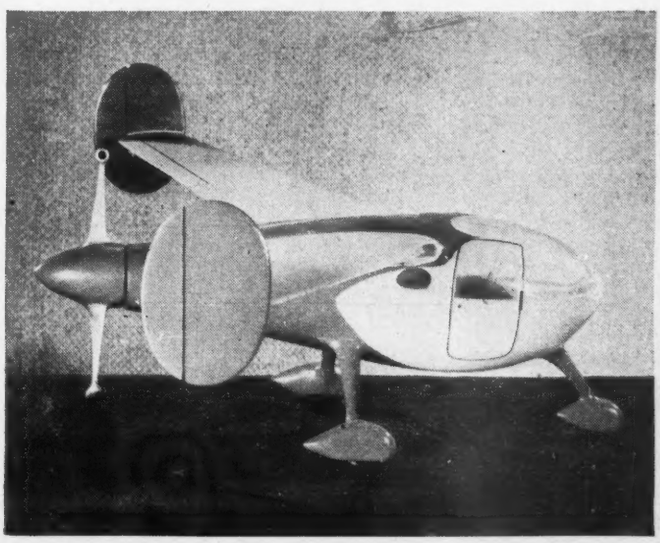
Commonwealth Skyranger

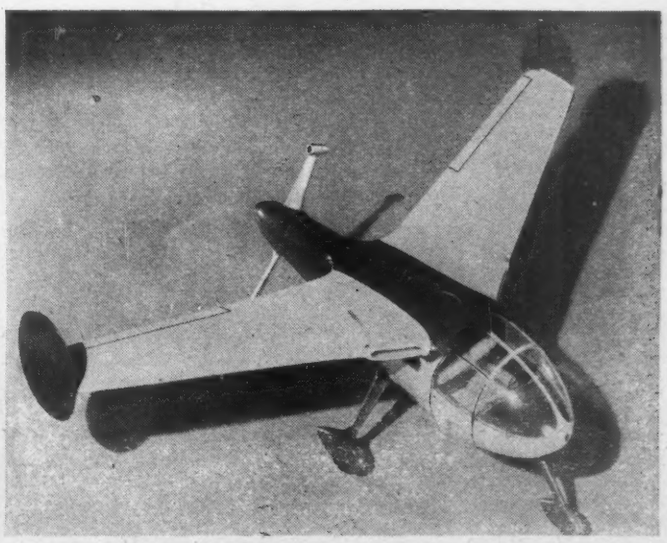
Priced at $2,750 and designed for cross country flying. With 85-hp. Continental it has cruising range of 600 mi. and top and cruising speeds of 114 and 103 mph., respectively. Landing speed is 38 mph. Features include starter, battery, generator and lights, two-position propeller and trim tabs.



Cessna 120 and 140

Postwar entries in personal plane field include all-metal two place craft powered with 85-hp. Continental, giving top speed of over 125 mph. Model 140 is de luxe version. Insulated cabin, hydraulic brakes and steerable tail wheel are standard on 140. Fuel capacity is 25 gal. Priced at $2,495.



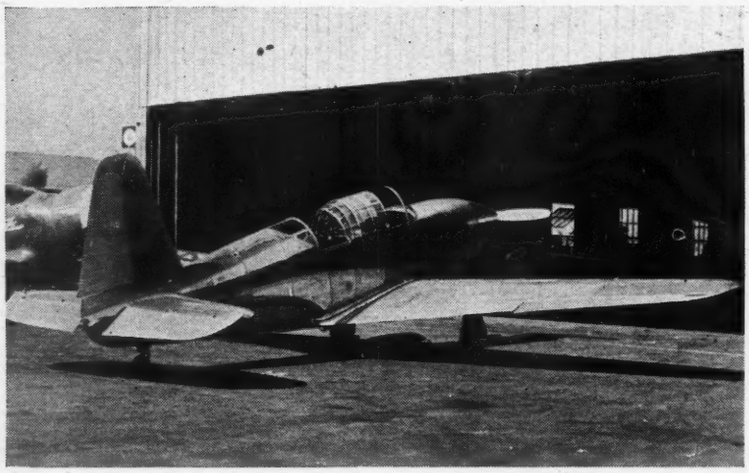


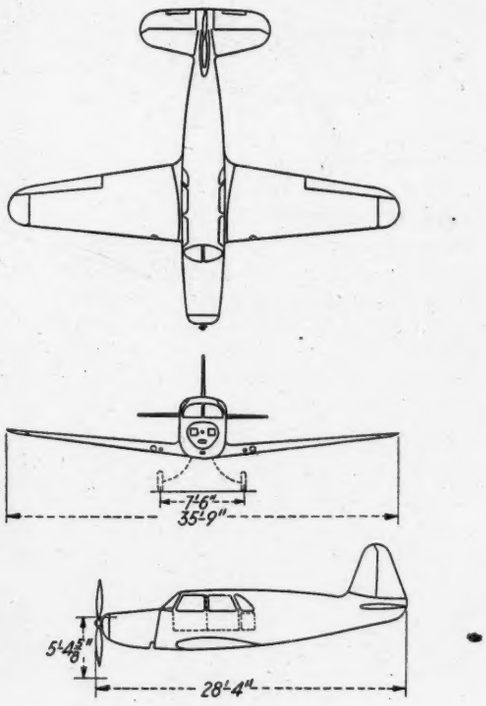
NACA Research Possibilities

Showing possible trend toward use of jet propulsion through propellers for personal aircraft are these ideas now being investigated by NACA Aircraft Engine Research Laboratory. Pusher type would take in air through ducts in wing leading edge to compressor in propeller hub, then out through blades, with fuel injected and ignited in prop-tip combustion chambers where reaction to turn propeller would take place. In tractor version, air would be taken in through propeller hub and compressed by centrifugal force in hollow blades. Again, fuel would be injected and ignited in combustion chambers at tips. Both designs are in preliminary stages, but NACA engineers feel such units might ultimately be more economical than conventional engines.

Harlow PJC-4 and PJC-10

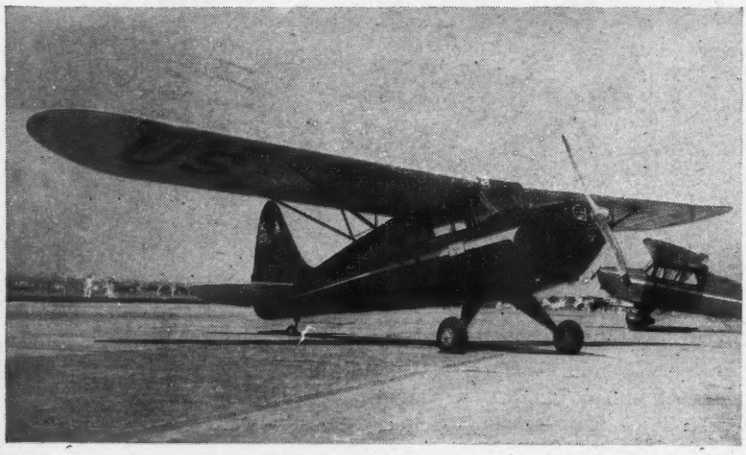
Two models under development by Max B. Harlow—photo shows model 4, a two-place craft, and three-view shows model 10, a four-placer. With same power plant—220-hp. Lycoming, performance for both is: High speed, 170 mph., cruising speed, 150 mph., initial climb, 1,200 fpm., service ceiling, 15,500 ft., range 804 mi.

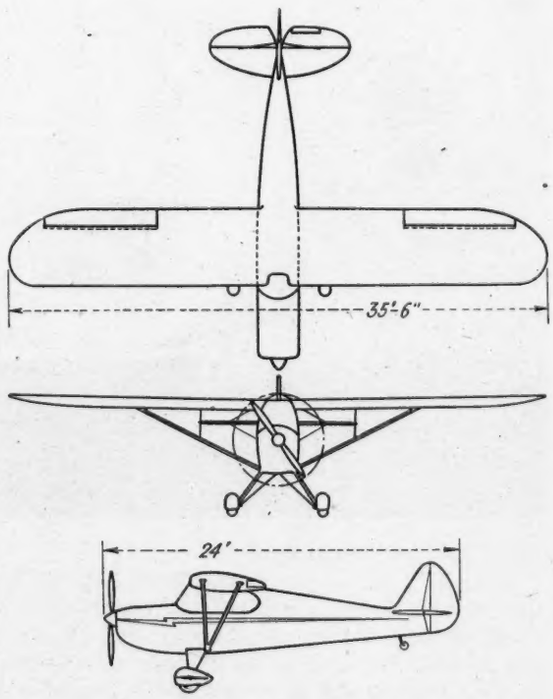




Harlow Cadet

Basically the two-place tandem seater Interstate Aircraft Cadet design which has been taken over by Harlow firm. Powered by 65-hp. Continental, it has a sea level top speed of 109 mph., cruising speed of 100 mph., initial climb of 625 fpm., and service ceiling of 15,000 ft. A 15-gal. fuel capacity gives cruising range of 375 mi.

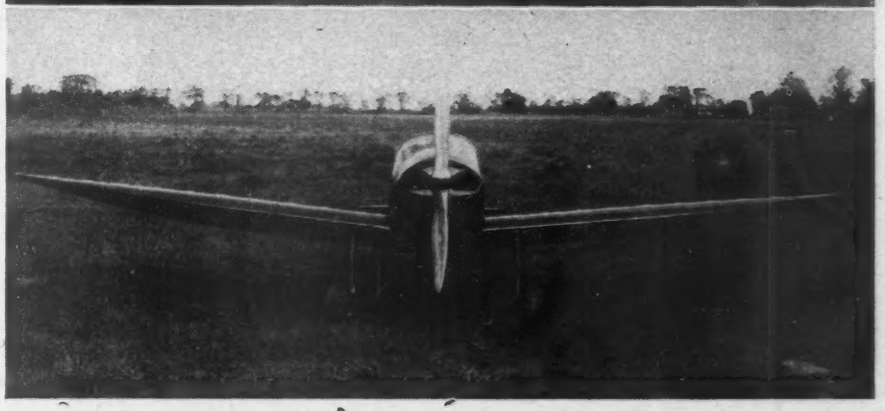




Kieth E. Robertson, Dir. of Sales.

All American Ensign

Designed for a $3,000-retail price, this new design features the war-born bubble type canopy and flush riveting on both fuselage and wings. Retractable landing gear will be available on production models, which will have 85-115 hp. engine range. With 85-hp. Continental, high and cruising speeds are 125 and 115 mph. respectively.



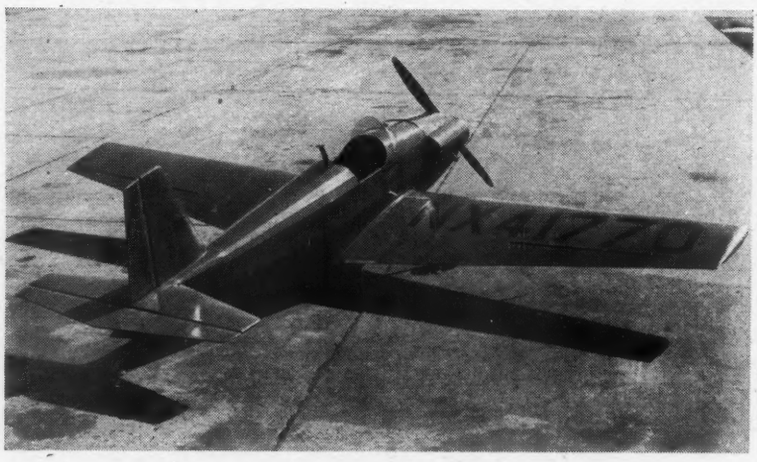
Applegate & Weyant Dart

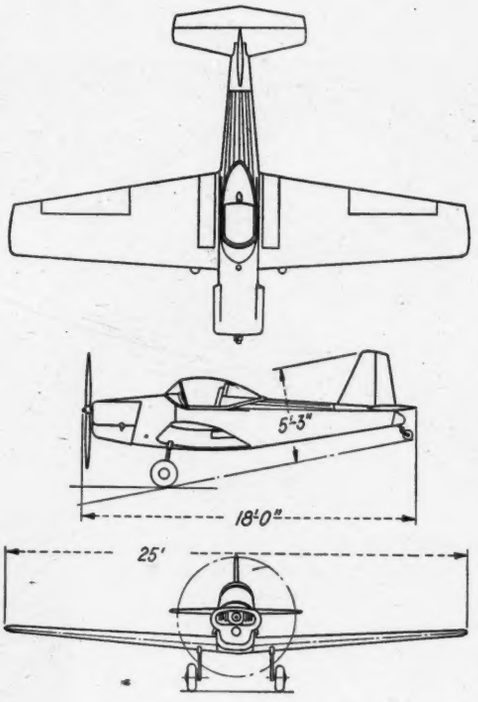
A well-known prewar type now fitted with a 100-hp. 6 cyl. Continental engine said to give greater speed and visibility than was case with original radial engine installation. With new power plant, high speed is increased, cruising speed is 120 mph. at six gal. per hr. fuel consumption and landing speed is 42 mph.

Ray Applegate, Pres. & Chief Engr.

Aviation Boosters Skyhopper

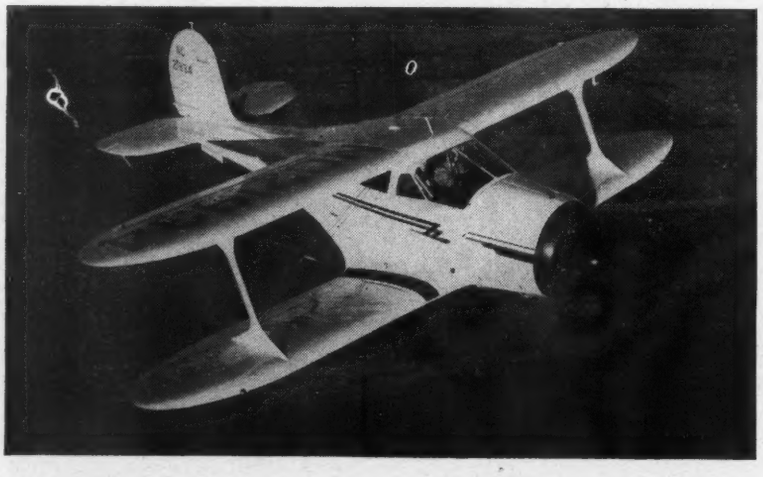
Designed to retail at approximately $1,000, this single-place craft has fabric covered wood wing, fabric covered steel tubular fuselage, plywood fin and stabilizer, and fabric-covered rudder and elevators. With 50-hp. Continental, top speed is given as 125 mph., cruising, 110, initial climb, 750 fpm., range approximately 275 mi.

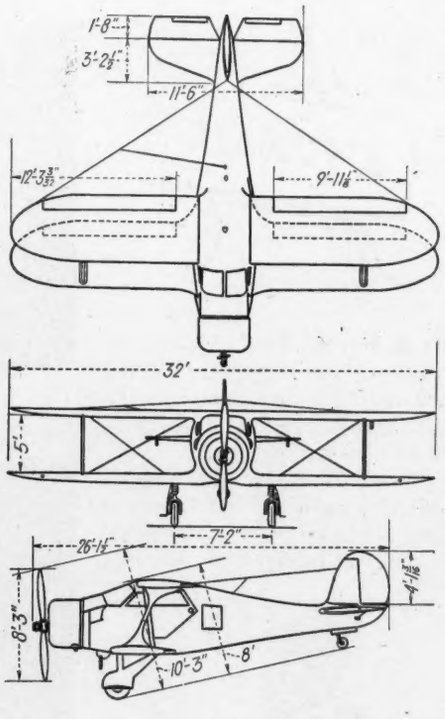


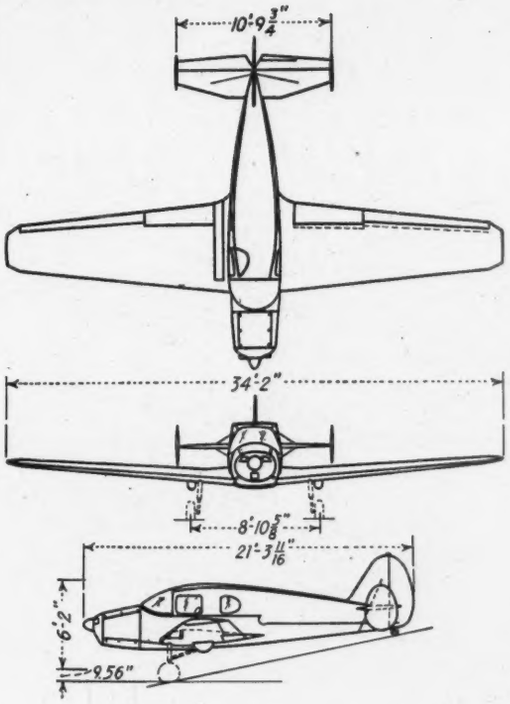


Beech G17S

A favorite prewar and wartime high performance five-place craft powered by Pratt & Whitney Wasp Jr., rated at 400 hp. at 5,000 ft. With 124-gal. fuel capacity, cruising range is 1,050 mi. High speed is 208 mph. at 5,500 ft., cruising speed is 181 at 10,000 ft., initial climb is 1,250 fpm. and service ceiling is 18,000 ft.

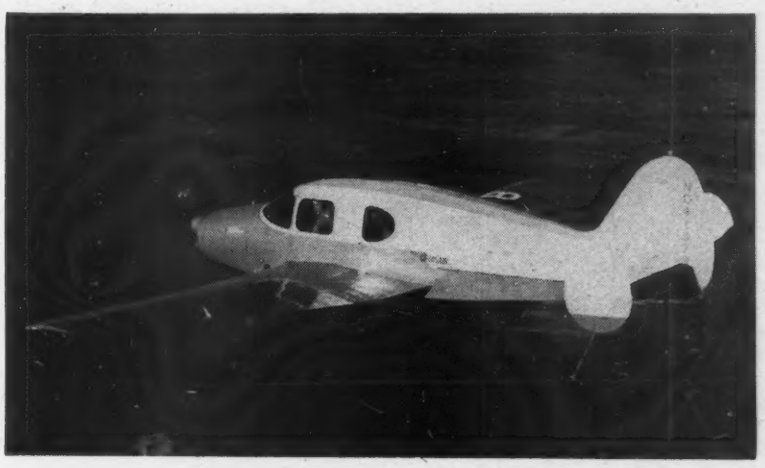






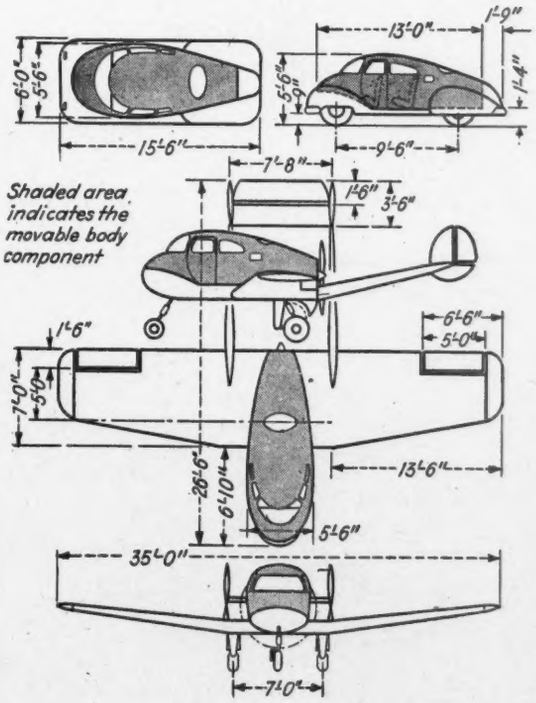
Bellanca Cruisair Senior

Developed from the prewar model, Senior is a four-place craft powered by a 150-hp. Franklin giving high speed of 169 mph. at sea level cruising of 153 at 3,000 ft., and initial climb of 1,130 fpm. Forty-gal. fuel capacity gives cruising range of 600 mi. Wing is plywood; fuselage is fabric covered tubular steel. Priced at $4,500.



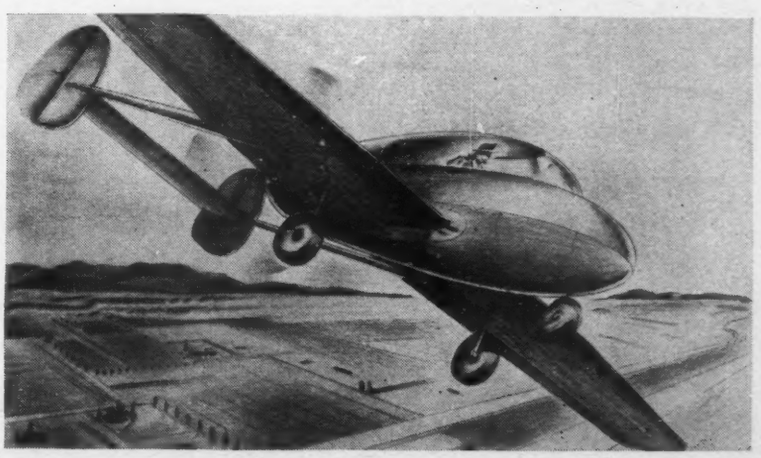
H. A. (Buzz) Hershfield, Sales Mgr.

H. D. Boggs, Designer



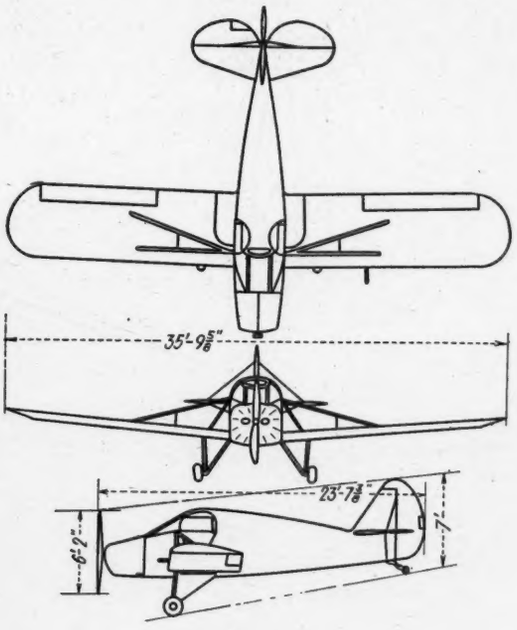
Boggs Airmaster Air-Car

Unique design in which aircraft's body, including powerplant, may be quickly removed from airframe and installed in special auto chassis for ground use. Airframe design is four-place low-wing pusher with twin booms and rudders and tricycle landing gear. With 145-hp. fan-cooled engine, top speed is set at 150 mph.



Call A2

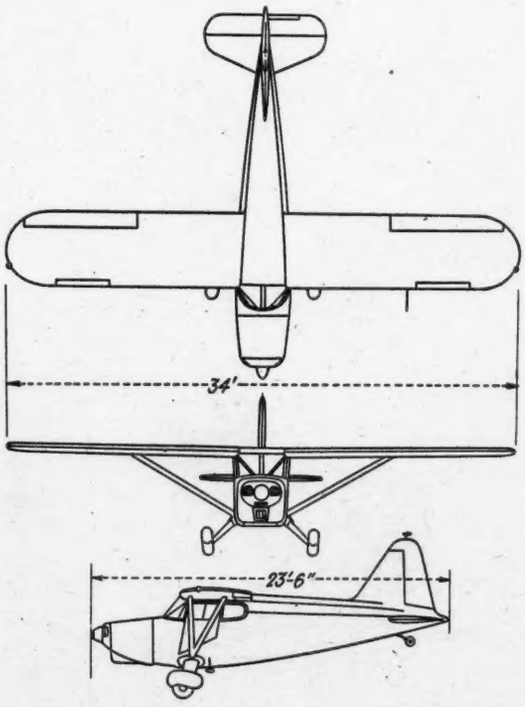
Two-three place prototype powered by 125-hp. Lycoming giving sea level high and cruising speeds of 120 and 109 mph., respectively. Initial climb is reported 1,000 fpm., and service ceiling 17,500 ft. Fuel capacity of 27 gal. gives range of 354 mi. Wood wing is fabric covered, as is steel tubular fuselage.

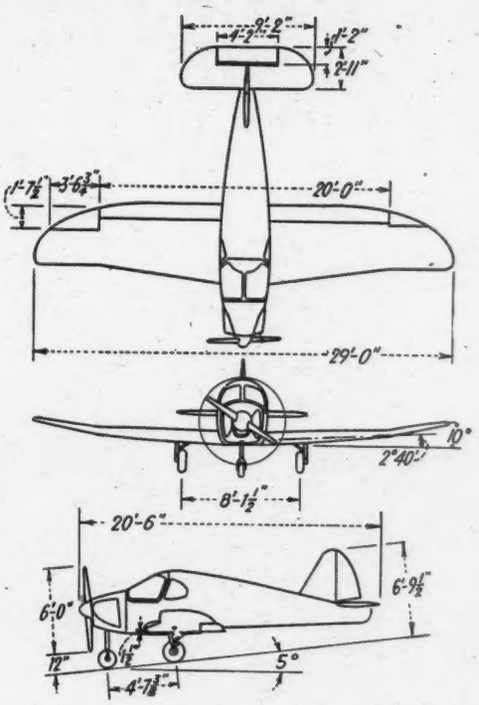


Jas. C. Welsch, Sales Mgr. Personal Plane Div.

Convair Stinson Voyager 150

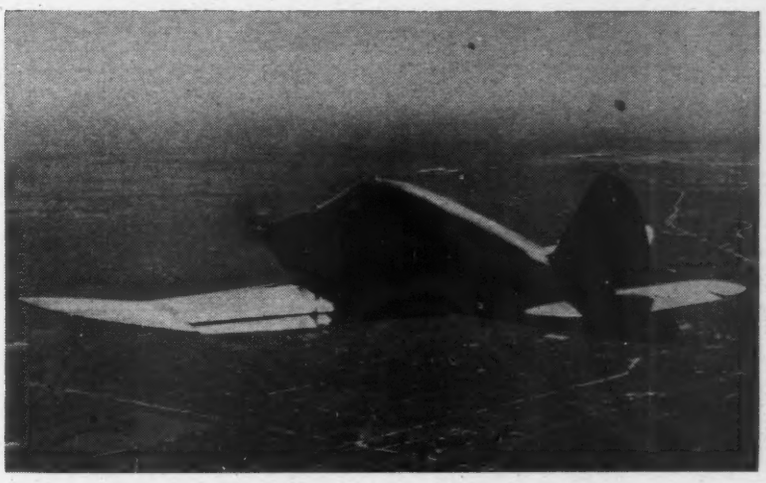
Priced at $5,000 this newest and largest Voyager with 944-lb. useful load, is powered by 150-hp. Franklin giving high speed of 133 mph., cruising speed of 125, initial climb of 770 fpm., and cruising range of 500 mi. New design features include metal tail for increased maneuverability; wing slots and improved brakes.



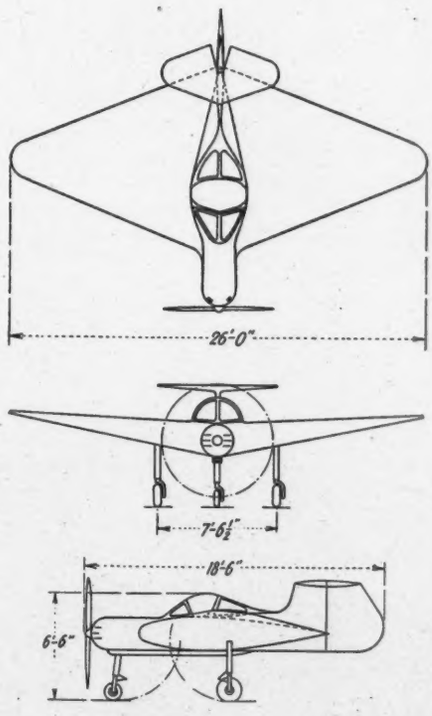


Culver V

Features Mooney "Simpli-Fly" control which, through interconnection between flap and stabilizer, trims plane according to settings put on flight control dial by pilot; inherent anti-stall and anti-spin characteristics; and retractable tricycle landing gear. Power by 85-hp. fuel injection Continental. Priced at about $3,750.

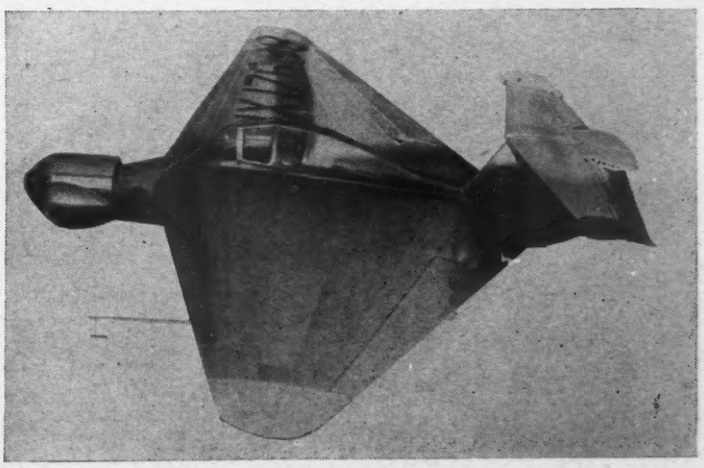


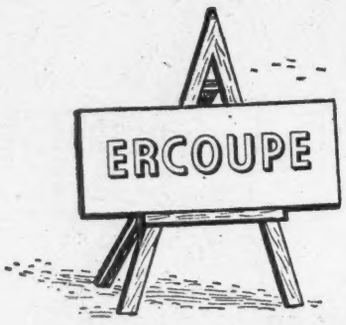
Robt. R. Nadal, Sales Mgr.



Eichman Aerobat A

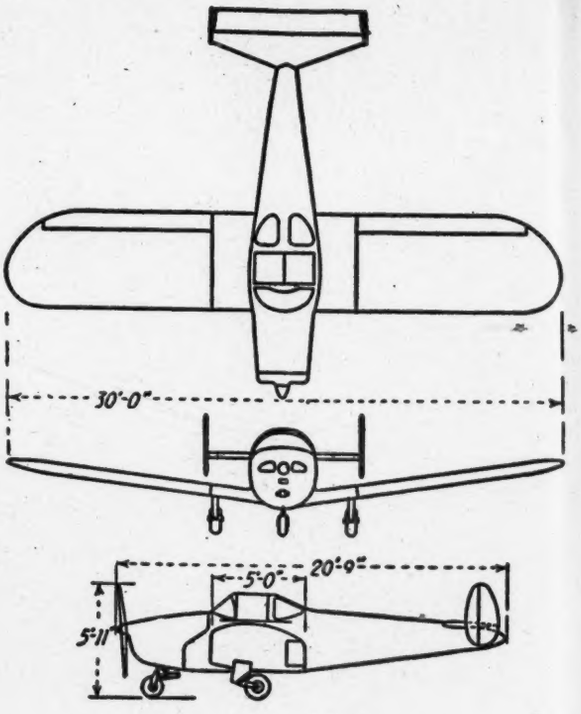
All-metal flying wing which eliminates need for ailerons. Continental 50 gives 95-100-mph. top speed; 75-mph. cruising. Successor, Model B, is two-place craft with 75-hp. Lycoming giving sea level high and cruising speeds of 125 and 110 mph., respectively. Normal range of B is 1,000 mi., landing speed is 40 mph. Price on A is given as $2,000-$2,500.



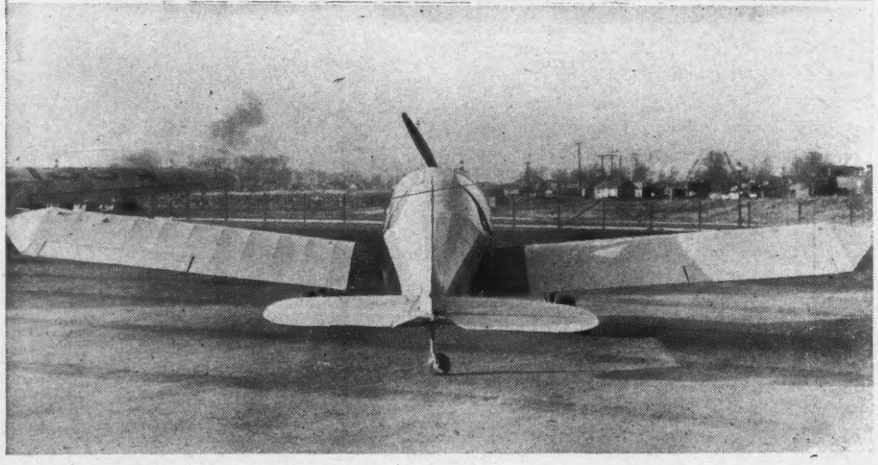


Ercoupe AA-2

Famed Weick-designed two-control, spinproof two-place all-metal craft with cleaned-up postwar production models powered by 75-hp. Continental giving cruising range of 500 mi., high speed of 127 mph., cruising speed of 110 mph., initial climb of 750 fpm., and service ceiling of 14,000 ft. Landing speed is 48 mph. Selling for $2,994.

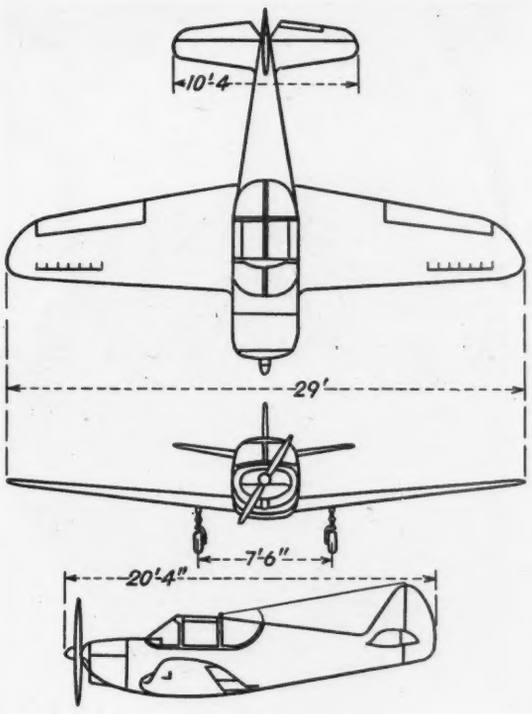


Geo. F. Ryan, Dir. of Sales



Eshelman Winglet

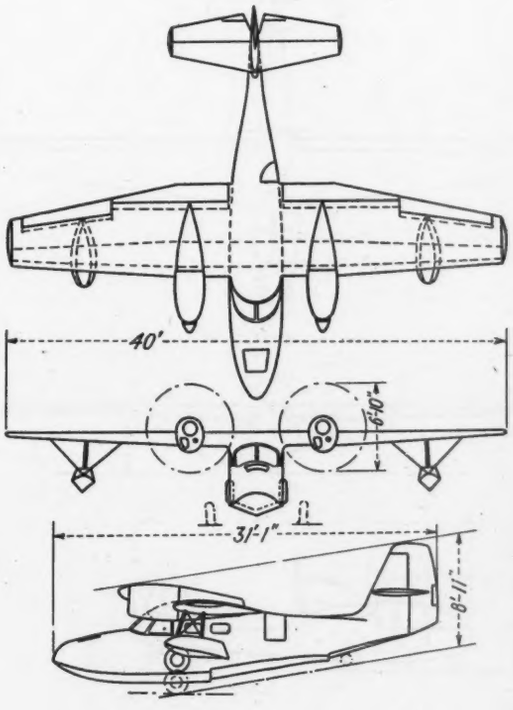
New two-placer designed to retail for $2,500-$3,000, featuring tubular chrome-molytapered wall-thickness spar which also serves as fuel tank. With 100-hp. Franklin, design high speed is 131 mph., cruising speed, 110 mph., initial climb, 867 fpm., and service ceiling, 14,450 ft. Starter and radio are standard equipment.



Globe Swift GC-1A

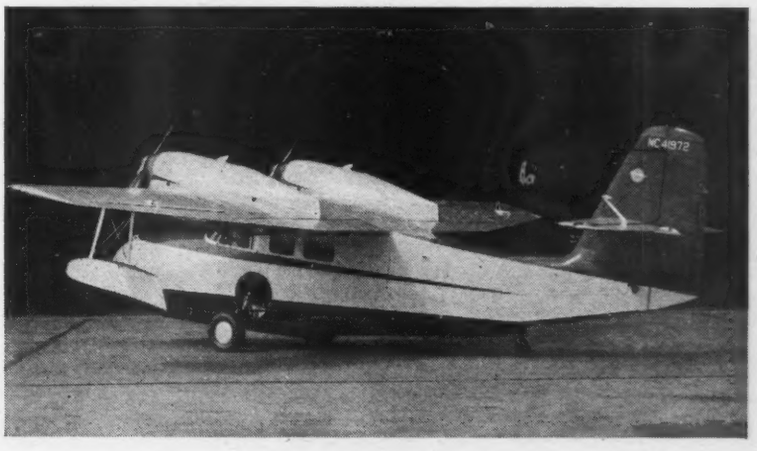
Priced at $3,495, this all-metal two-place plane is powered by 85-hp. Continental and has a high speed of 140 mph., cruising speed of 125 mph., landing speed with flaps, of 42 mph., and, with 30-gal. fuel capacity, a range of 750 mi. Initial climb is 700 fpm., and service ceiling is 14,500 ft. A 125-hp. version is priced at about $3,995.

Joe Howell, Sales Supervisor



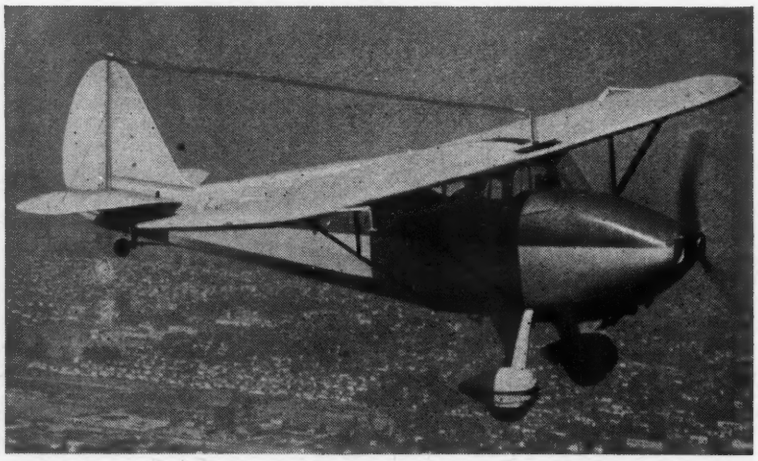
Grumman Widgeon

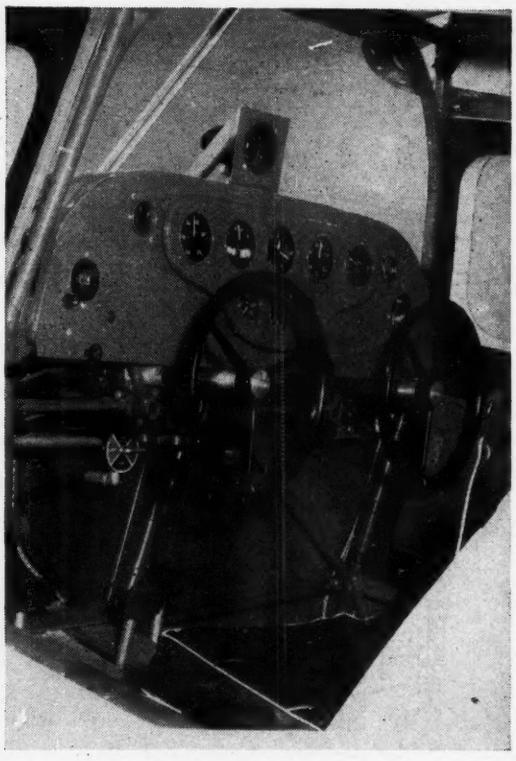
Well known both before and during the war, demand for this 4-5 place all-metal amphibian has kept it in production. Powered by two 6-cylinder 200-hp. Ranger engines, it has high speed of 164 mph., cruising speed of 150 mph., initial climb of 1,000 fpm., service ceiling of 15,500 ft., and range of 775 mi.



Hockaday Comet

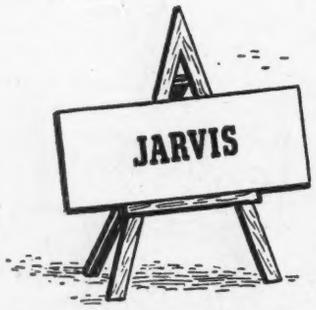
With 130-hp. Franklin engine, Comet has high speed of 150 mph., cruising speed of 130 mph., initial climb of 1,150 ft. and service ceiling of 19,000 ft. Twenty-four-gal. fuel capacity gives cruising range of 500 mi. Wood wing is fabric covered; steel tube fuselage is half metal, half fabric covered. Priced at about $3,000.





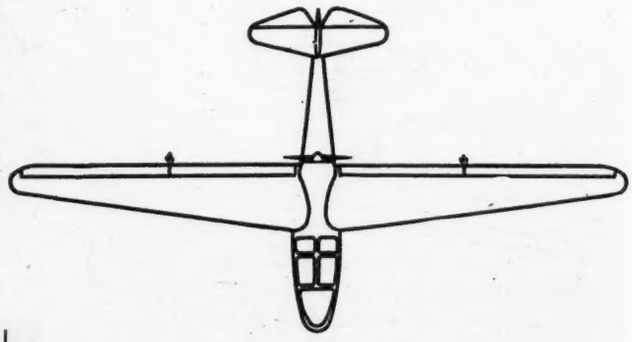
Noel R. Hockaday, Pres.

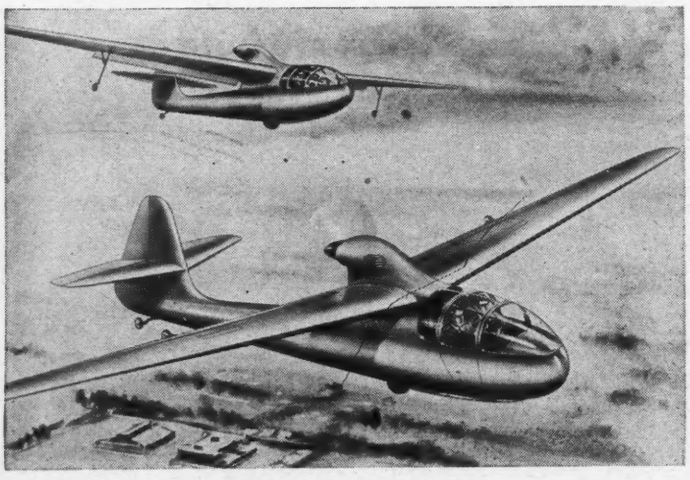
Wayne Yarrick, Sales Mgr.

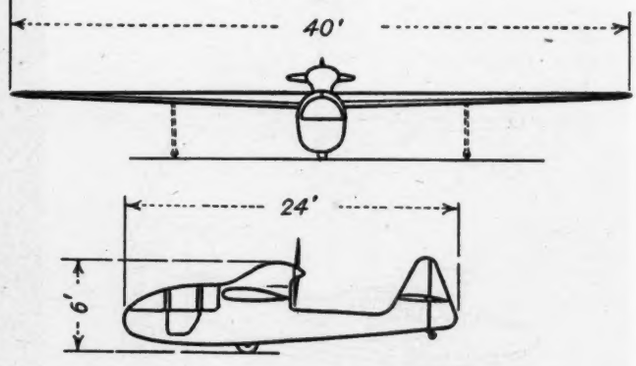


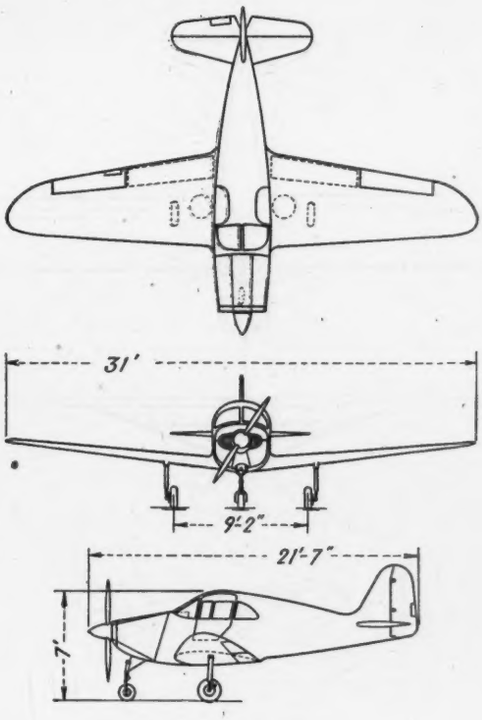
Jarvis VJ-21

Designed to sell for less than $2,000 and built along sailplane lines. With 65-hp. Lycoming it has 135-mph. high speed; 110 cruising and, with 15-gal. fuel capacity, range of 400 mi. Landing gear comprises single main wheel mounted in fuselage bottom, tail wheel and two manually-retractable wingtip wheels.



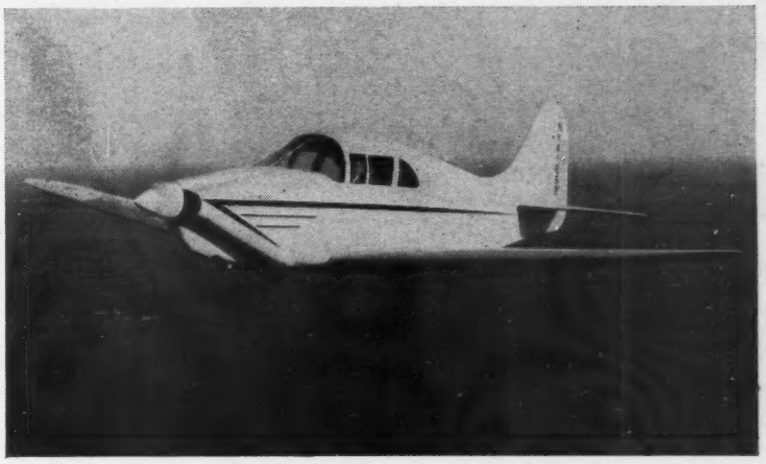




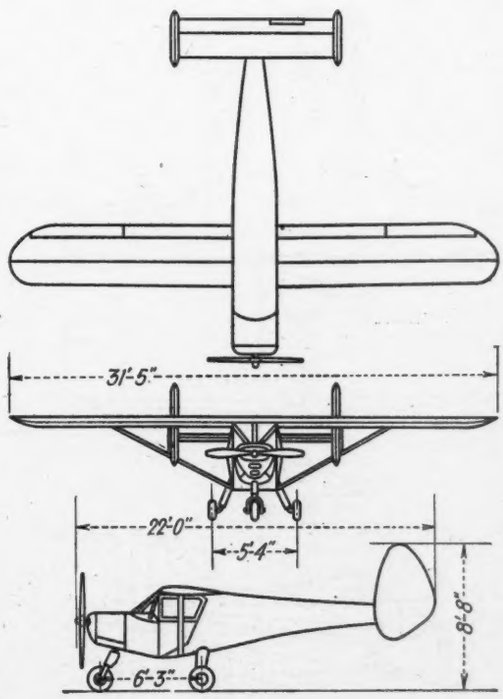


Johnson Rocket

Built for $5,000 price bracket, this two-place craft features variable pitch propeller and 185-hp. engine giving estimated cruising speed of 185 mph., initial climb of 2,000 ft., service ceiling of 24,000 ft. and cruising range of about 1,000 mi. Trim tabs, hydraulically-retractable tricycle gear and starter are among standard equipment units.

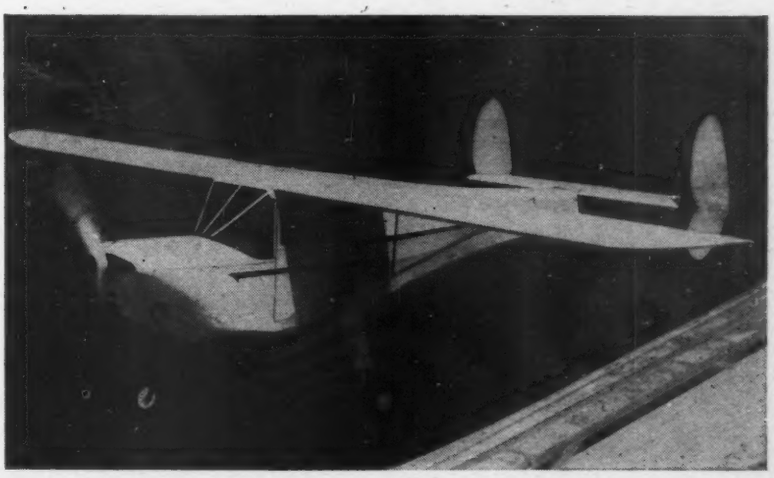


Bill Buford, Dir. of Sales



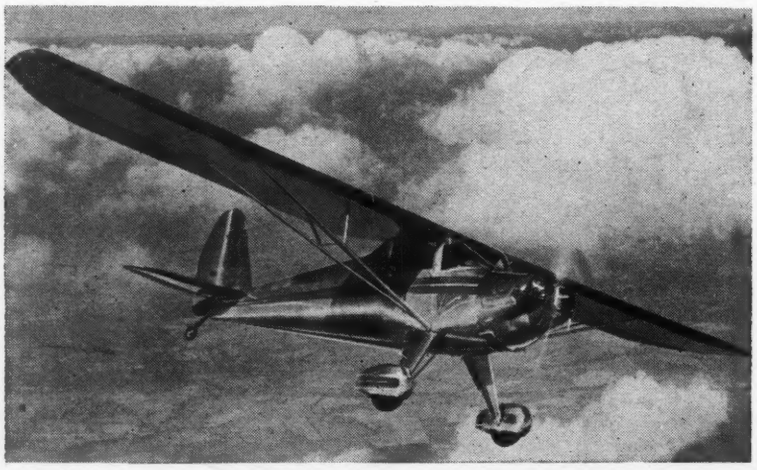
Le Mars Skycoupe

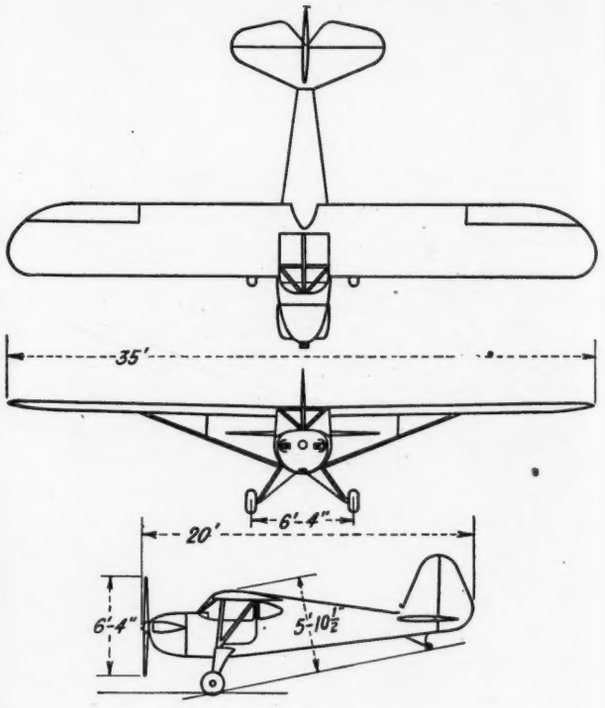
General's two-control spinproof design now being produced by Le Mars Mfg. Co. with either Lycoming 75 or Continental 85-hp. engine. With 75-hp. unit it has high speed of 100 mph., cruising speed of 92 mph., initial climb of 550 fpm. and cruising range of 400 mi. This design eliminates rudders and is controlled by wheel alone.



Luscombe Silvaire

Being offered in two versions: 8A and 8E, powered by 65- and 85-hp. Continentals, respectively. With latter power plant, high speed is 133 mph., cruising speed, 115 mph., initial climb, 750 fpm., and service ceiling, 15,000 ft. Fourteen- and 24-gal. fuel capacities give 400- and 550-mi. ranges.



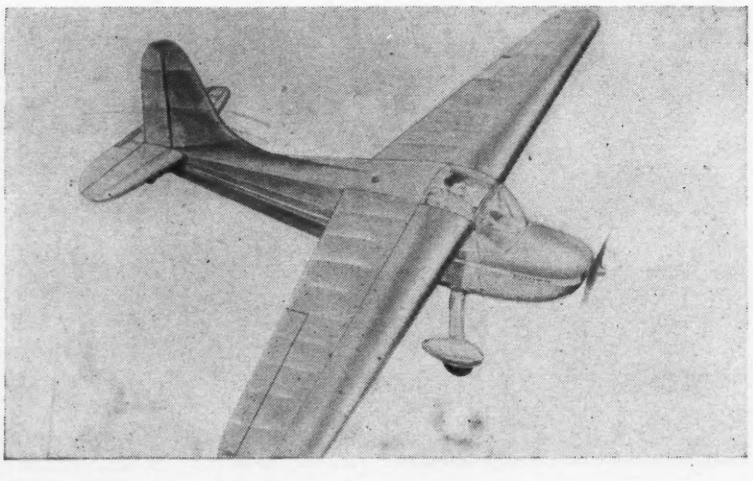


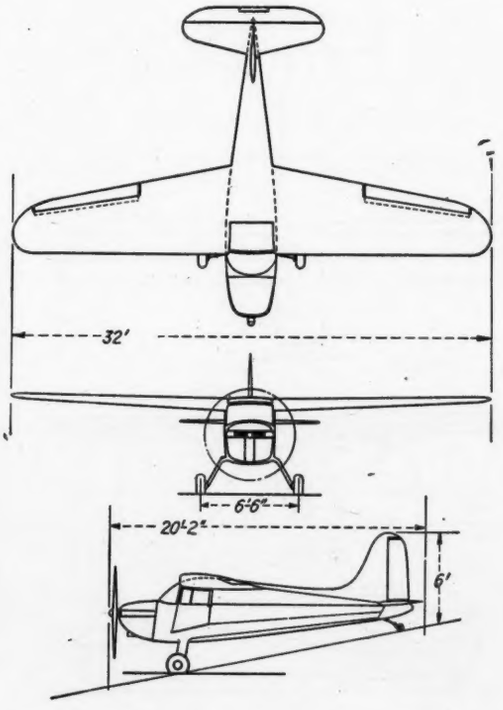
Douglas Hayward, Sales Mgr.

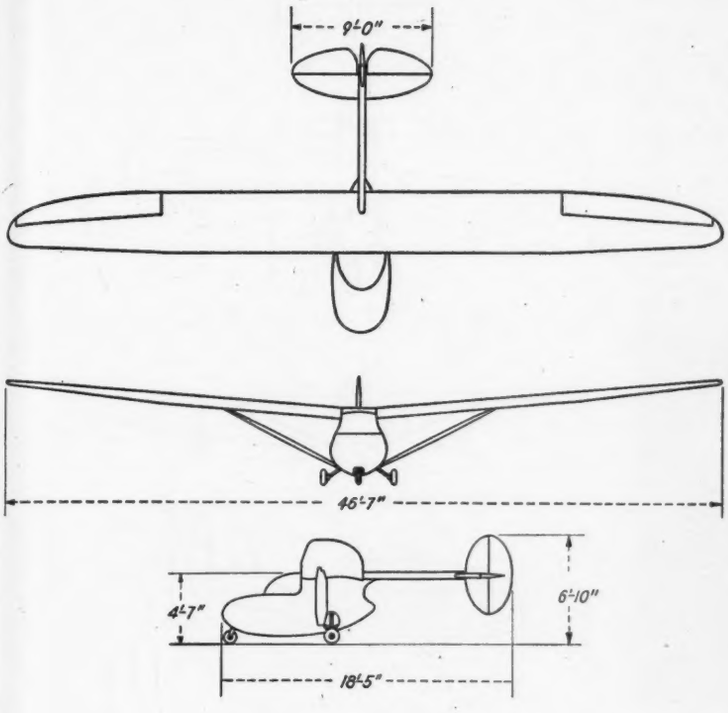
Joseph W. Hance, Sales Mgr.

Midwest Mercury

Built around single spar, full cantilever all-metal wing, this two-place craft will be offered with 65-hp. Continental, Lycoming or Franklin, and deluxe model with 75-hp. Continental. Standard model performance includes: 115-mph. top speed; 105-mph. cruising speed; 600-fpm. initial climb; 400-mi. range; and 14,000-ft. ceiling.

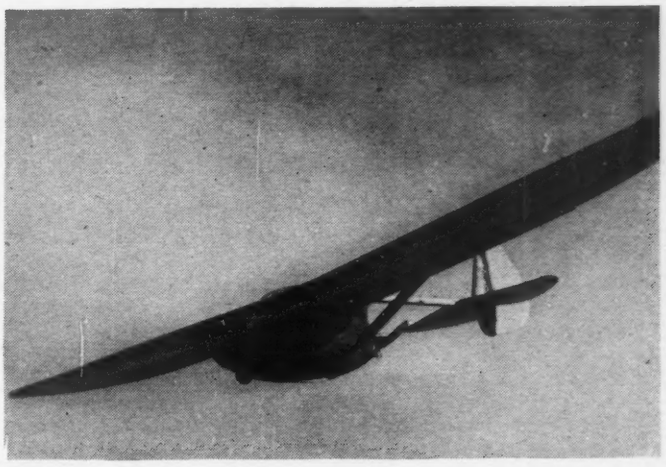




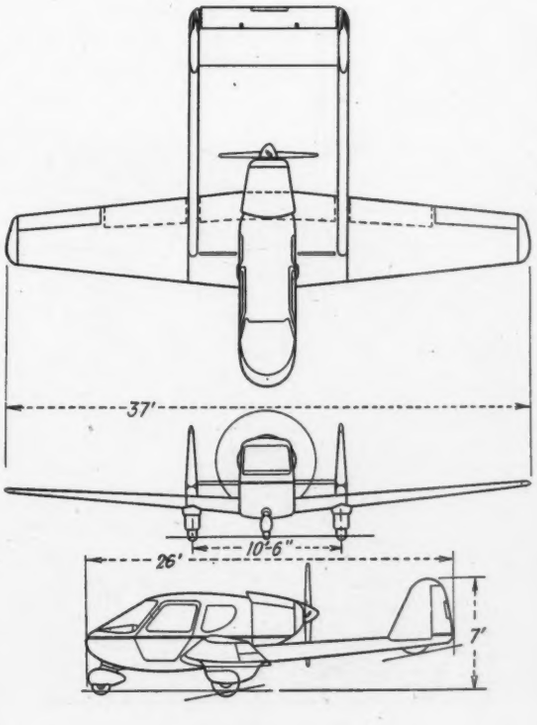


Nelson Bumblebee

Designed to sell for less than $1,000 in kit form, this craft is built for soaring or conventional flying. A 16-hp. Righter engine gives 75-mph. cruising speed, and 3-gal. capacity gives 1½ hr. at full throttle. A two-placer, it is all-wood construction except for hollow dural boom.

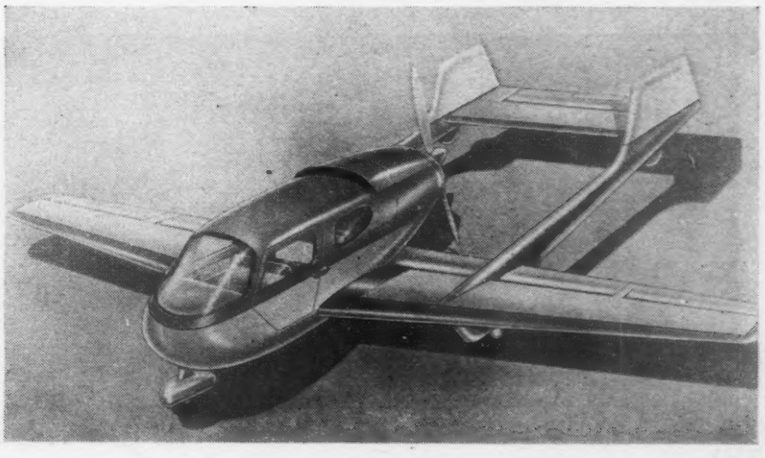


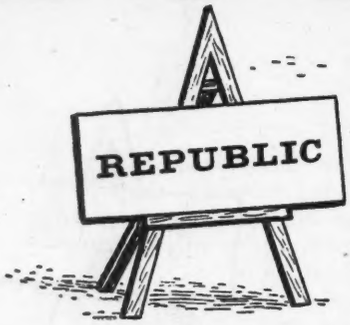
Leonard C. Barr, Sales Mgr.



Puget Pacific Wheelair 111A

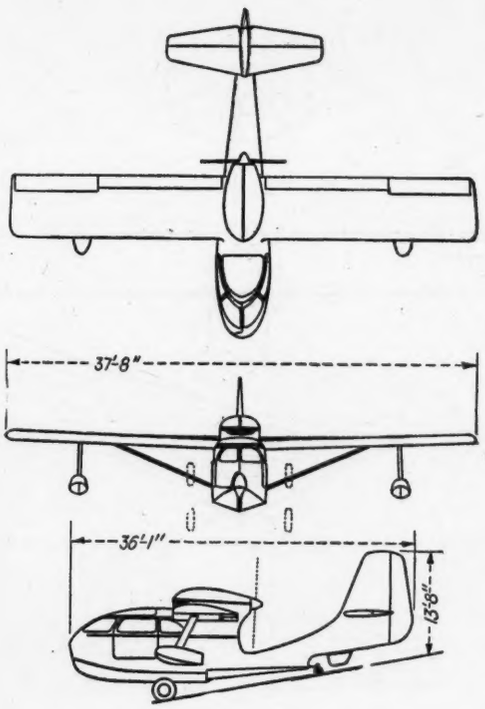
New four-place craft, prototype of which is now under construction, to be powered by 125-hp. engine slated to give high speed of about 114 mph., initial climb of 525 fpm., and service ceiling of 10,847 ft. An all-metal craft with fixed tricycle landing gear, it will have gross wt. of 2,290 lb., wt. empty of 1,260 lb.





Republic Seabee

Scheduled to retail for less than $4,000, production is now getting under way to meet orders. With 212-hp. Franklin, high speed is 120 mph., cruising speed is 102 mph., service ceiling is 12,000 ft. Fuel capacity of 75 gal. gives cruising range of 350 mph. Gross wt. is 3,000 lb., wt. empty is 1,980 lb.

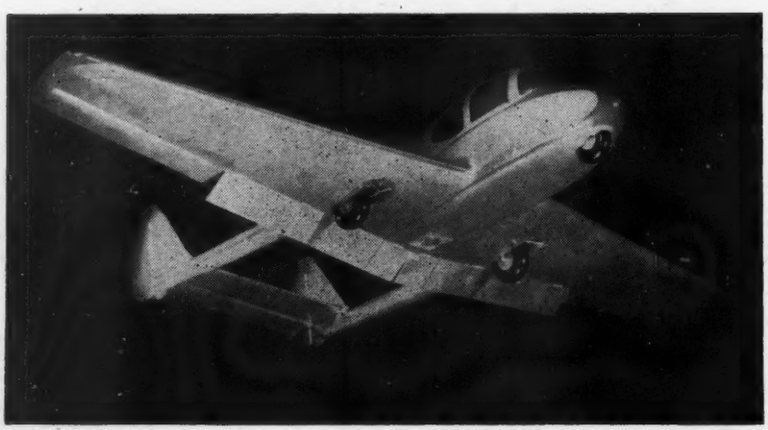


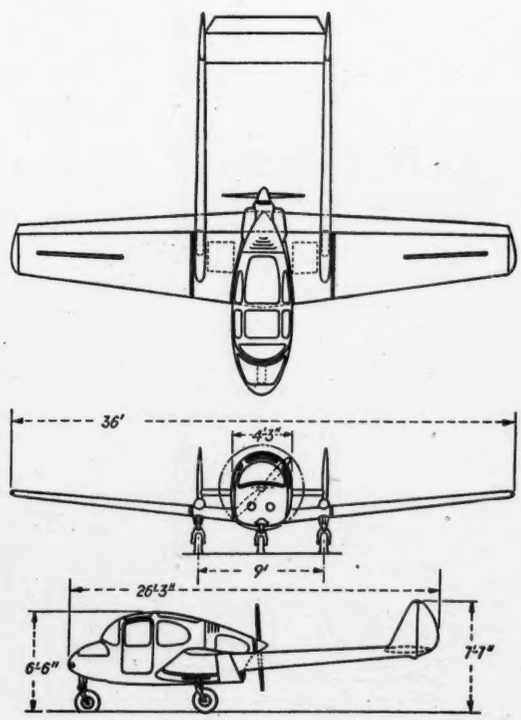
Gordon C. Sleeper, Sales Mgr. Personal Plane Div.

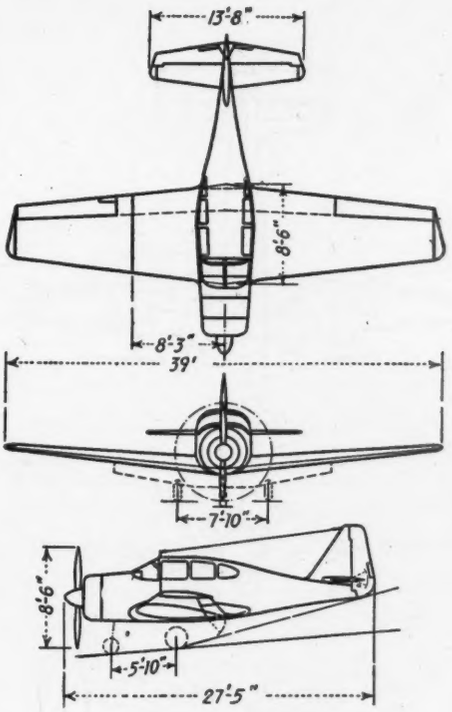
Cameron C. West, Sales Mgr.

Skylark Skycraft

An all-metal four-place design to be powered with 190-hp. Lycoming, Continental or Franklin engine. Performance is expected to be: High speed, 162 mph., cruising speed, 142 mph., landing speed, 49 mph., initial climb, 720 fpm., and service ceiling, 13,750 ft. Fifty-gal. fuel capacity would give 620 mi. range. Various models would sell for $4,000-$5,800.

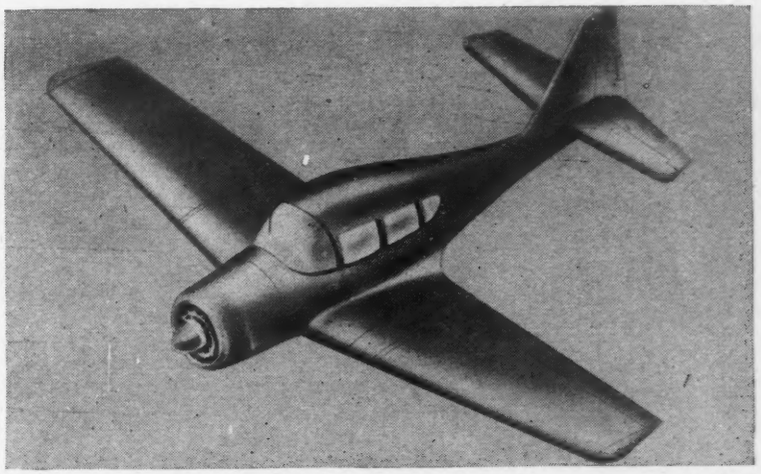






Spartan Executive 12

Postwar version of high performance all-metal five-place craft to be powered with 400-hp. Pratt & Whitney Wasp Jr., giving high speed of 218 mph., cruising speed of 203 mph., initial climb of 1,350 fpm., and service ceiling of 20,490 ft. With fuel capacity of 132 gal., cruising range is set at 1,097 mi. Priced at $14,000 to $20,000.



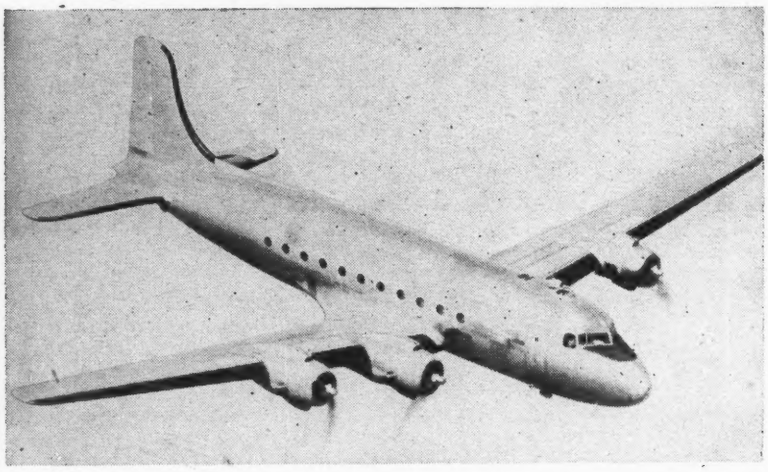
Winslow (Bud) Eddy, Sales & Service

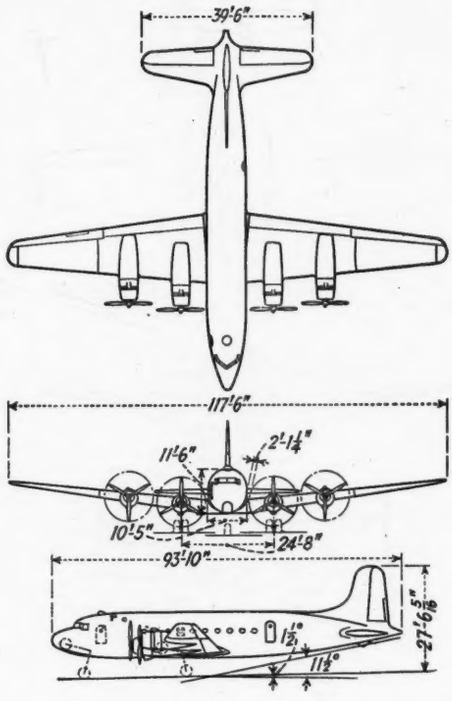
Tennessee Aircraft Skyfarer

Designed by Otto Koppen, who created original Skyfarer, this new all-metal two-control, spinproof craft now undergoing test has 75-hp. Lycoming and is designed for high speed of 100 mph., cruising speed of 92 mph., service ceiling of 10,000 ft. and cruising range of 400 mi. A 100-hp. model is now being designed.

Douglas DC-4

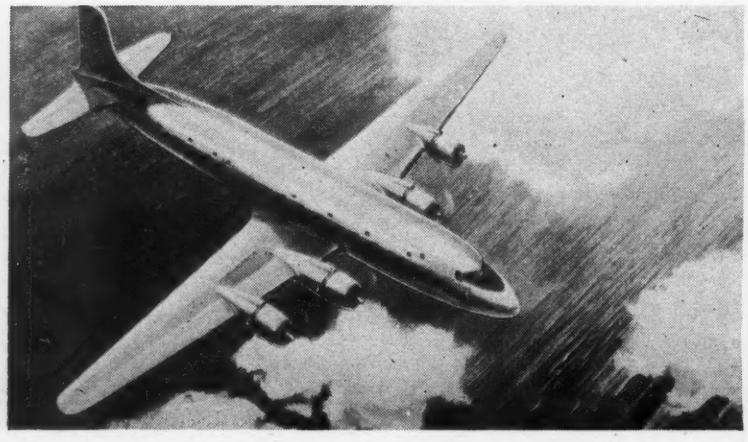
Peacetime successor to famed C-54 of worldwide military service, already in trans-ocean operation and going into domestic operation. Four 1,100-hp. P & W's give high speed of 270 mph. and cruising speed of 234 mph. Fuel capacity of 2,877 gal. gives range of 4,240 mi. On day operations carries 44 passengers.

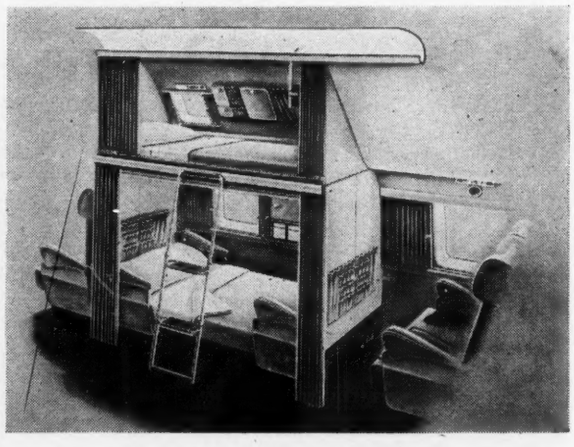


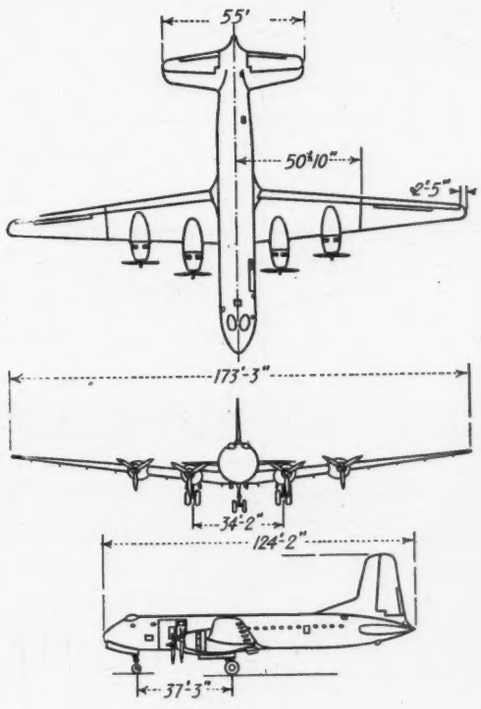


Douglas DC-6

Developed from DC-4, it is 7 ft. 2 in. longer and, powered by four 1,700-hp. P & W's, has high speed of 342 mph., cruising speed of 300 and range of 2,680 mi. As day liner, with crew of five, it carries 52 passengers; as sleeper plane its capacity is 26. Pressurized cabin will maintain interior altitude of 8,000 ft.

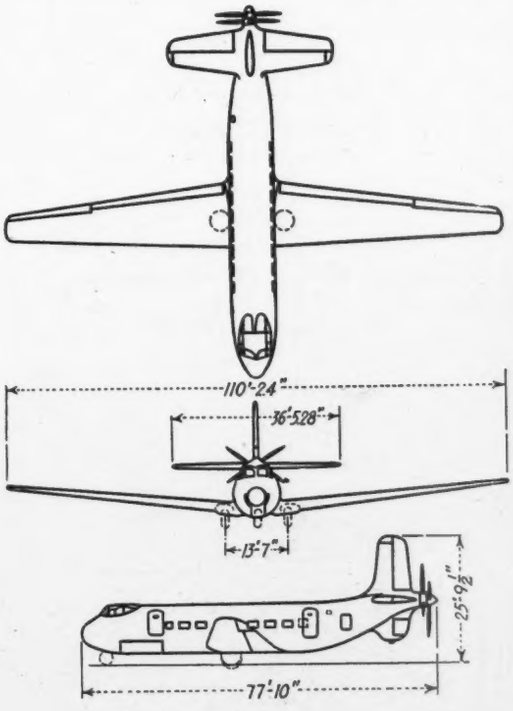






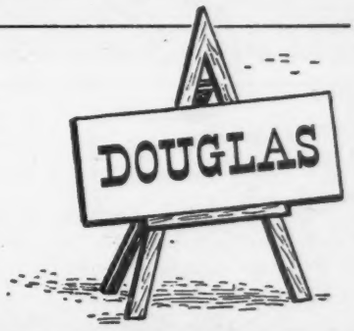
Douglas DC-7

Commercial version of C-74 cargo and troop carrier designed for long range high speed operations. Powered by four 3,500-hp. Pratt & Whitney Majors, it has high speed of about 400 mph., and cruising speed of better than 300 mph. Fuel capacity of 11,000 gal. gives range of better than 7,000 mi.



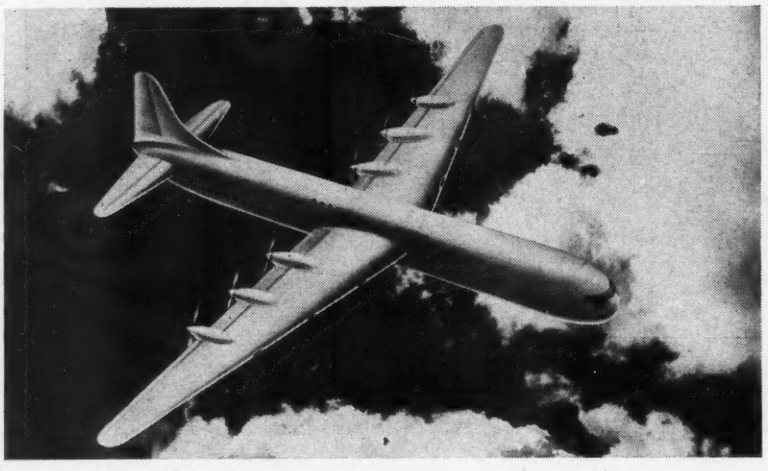
Douglas DC-8

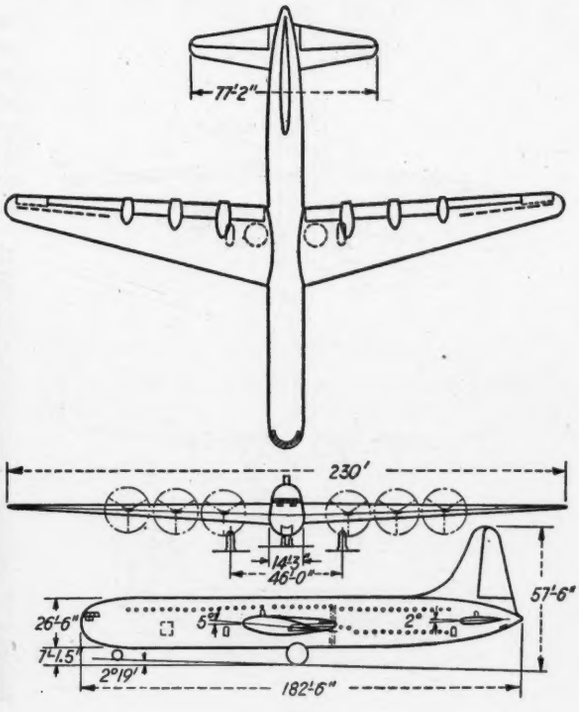
Unorthodox craft developed from XB-42 bomber designed to give direct plane-mi. operating cost of but 41.6¢ with 223 mph. block speed and payload of six tons over 300 mi. range. Two 1,240 hp. Allisons set in fuselage at wing leading edge drive contra-rotating propellers mounted aft of empennage. High speed is 292 mph.



Consolidated Vultee CV-37

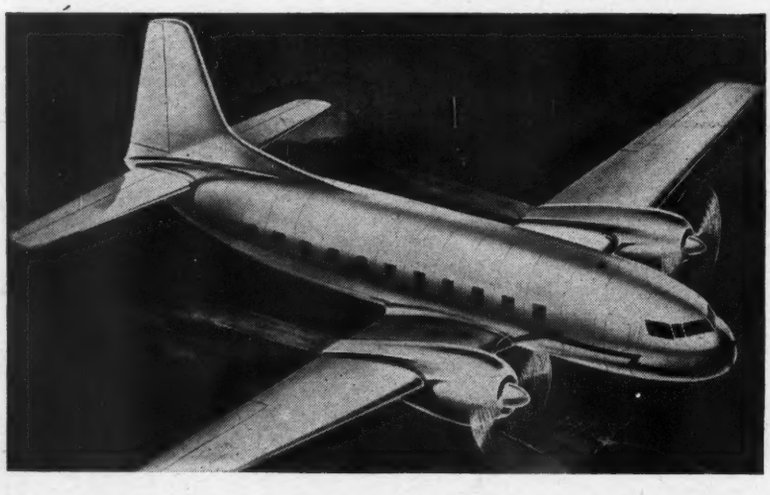
Long range high speed transport developed from B-36 and XC-99 and ordered by Panam. Six pusher engines of 5,000 hp. each will give high speed of 370 mph. at 20,000 ft., cruising speed of 340 at 25,000 ft., and range will be 4,200 mi. Carrying crew of twelve and 204 passengers, craft will have gross wt. of 320,000 lb.

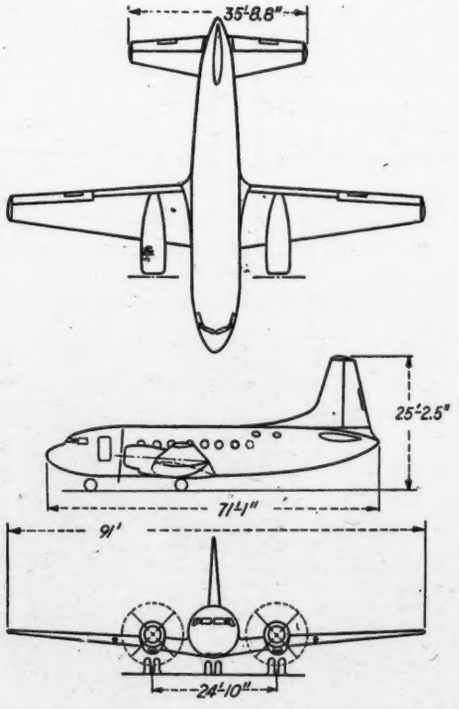




Consolidated Vultee CV-240

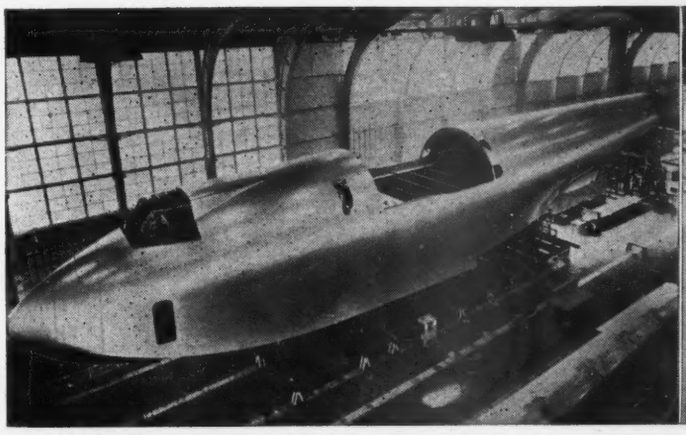
American Airlines has just ordered 100 of this new design (photo), a 40-passenger craft for domestic operations. Powered by two P & W R-2800's of 2,100 hp. each it will have high speed of over 350 and cruising speed of about 300 mph. Three-view drawing is CV-110, a 30-40 passenger 275-mph. liner.

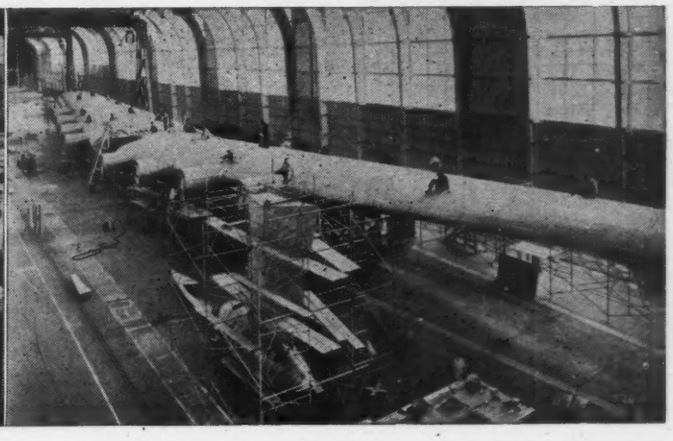




Hughes H-4

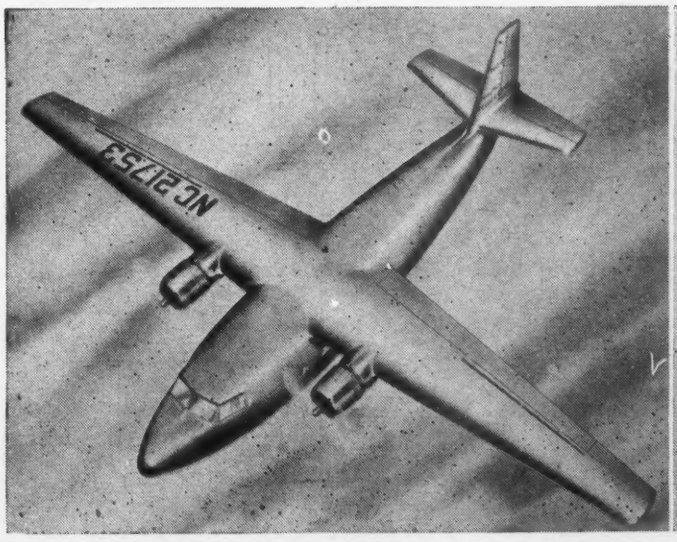
Now nearing completion, this all-wood cargo carrier is world's largest aircraft. Powered by eight Pratt & Whitney Wasp Majors it is designed for high speed of 218 mph. at sea level and cruising speed of 175 at 2,500 ft. Fuel capacity of 14,300 gal. would give range of 3,000 mi. Gross wt. will be 400,000 lb.

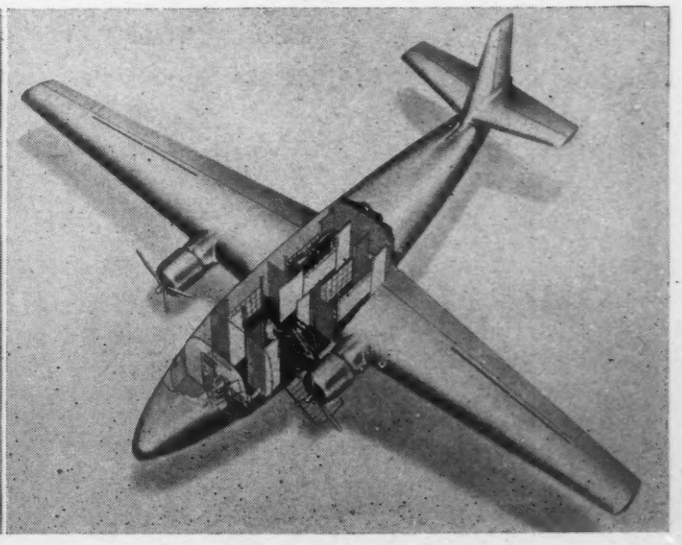




Hughes Feederliner

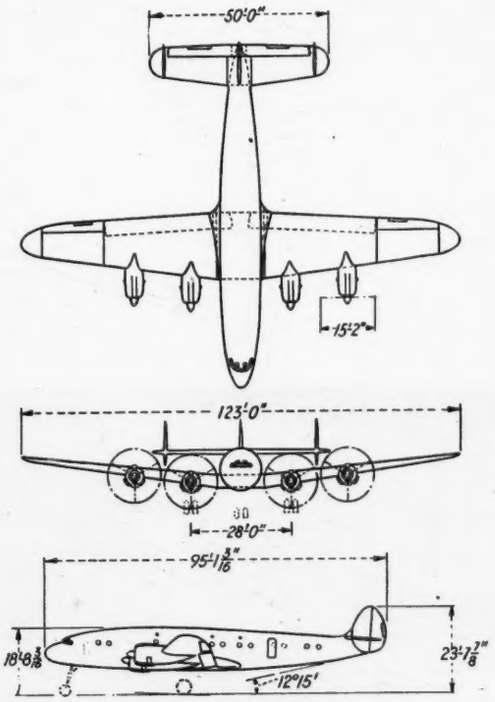
Combination passenger and cargo carrier design developed for low cost short haul operations. Features quickly movable bulkhead to vary cargo-passenger ratios so that maximum payload is made available at all times. Design calls for installation of two Pratt & Whitney Wasp Jr's. of 825 hp. each. Designed for retractable landing gear.





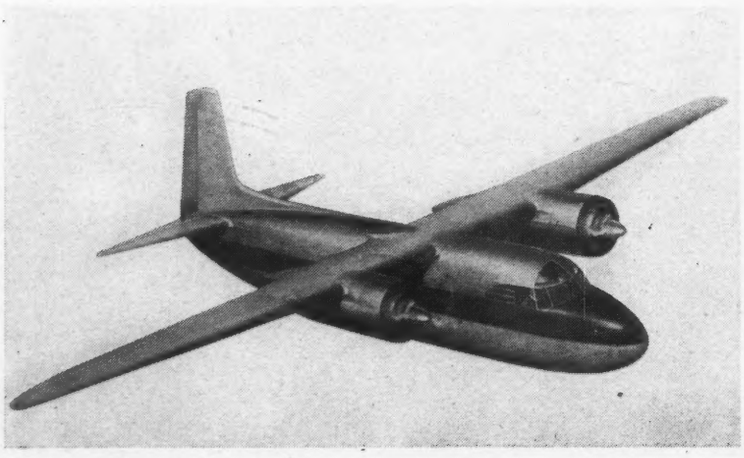
Lockheed Constellation

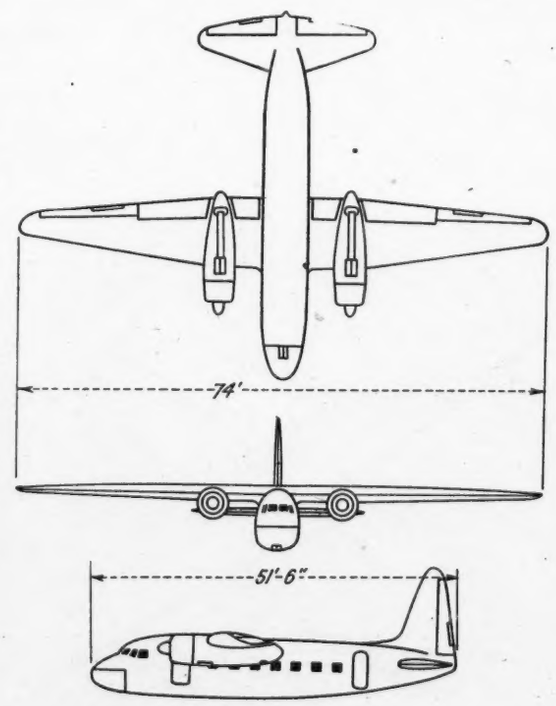
Long range high speed 69-passenger craft now going into both trans-ocean and domestic service. Powered by four Wright R-3350's of 2,500 hp. each, it has high speed of over 350 mph. at 18,000 ft. and cruising speed of 310 mph. at 20,000 ft. Fuel capacity of 4,690 gal. gives range of 3,000 mi. Gross wt. is 100,000 lb.

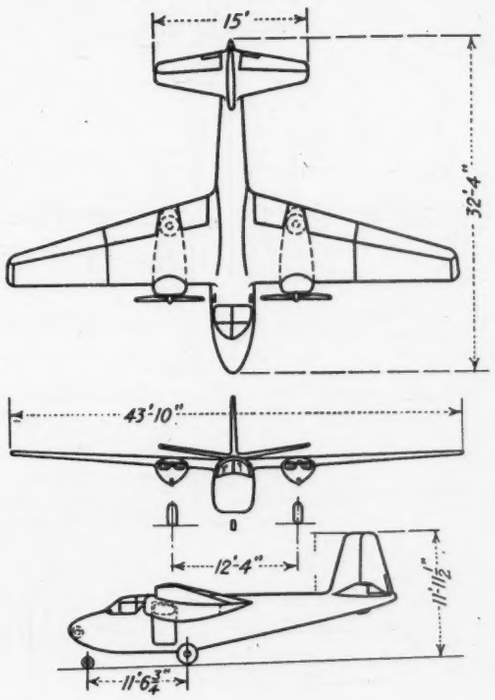


Lockheed Saturn

Sixteen-passenger and cargo carrier designed for feederline operations. Powered by two 600-hp. Continental-Wrights, design high speed is 248 mph. at 8,000 ft. and cruising speed is 200 mph. at 6,000 ft. Range is 1,600 mi. on 492-gal. fuel capacity. Landing speed is 72 mph. and initial climb is 1,460 fpm.

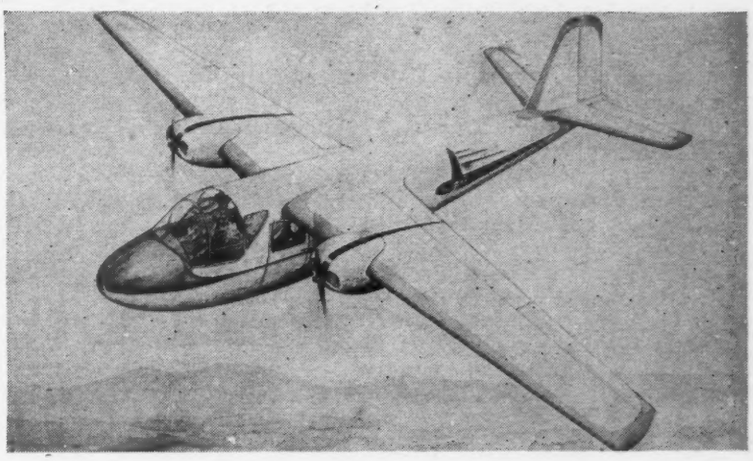


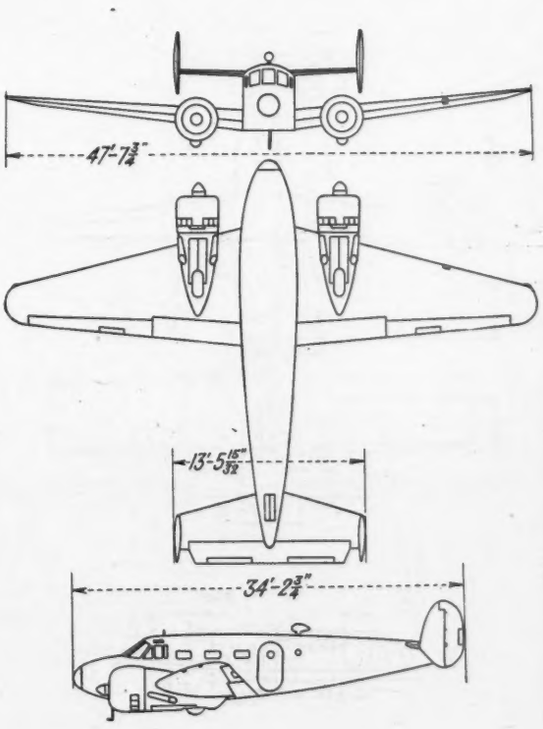




Aero Design & Engr. Aero Commander

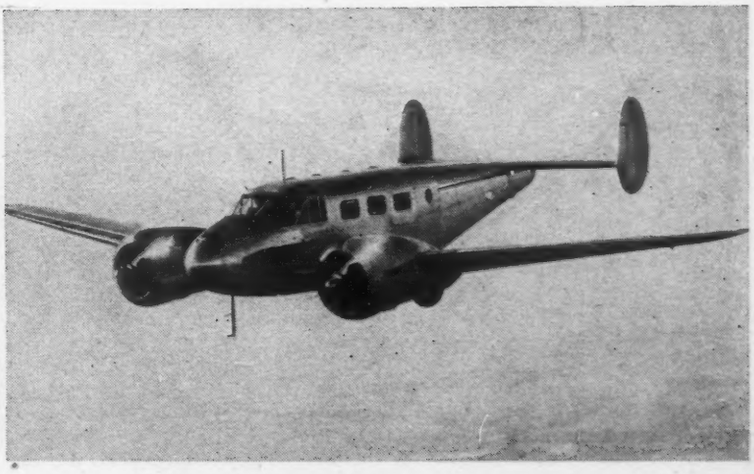
An all-metal six-place craft designed for feederline or executive transport. Powered by two 200-hp. Lycomings, design high speed is 185 mph. at sea level and cruising speed is set at 180 at 10,000 ft. A 100-gal. fuel capacity would give normal range of 700 mi. Empty wt. is 2,500 lb., gross is 4,200 lb.





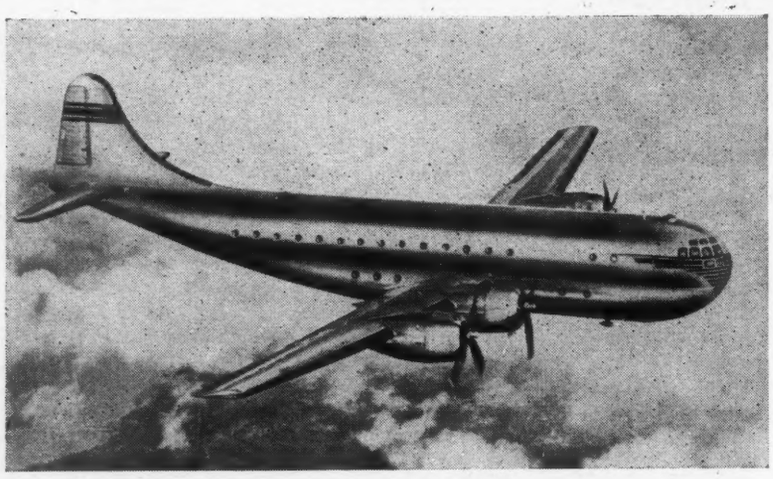
Beechcraft 18

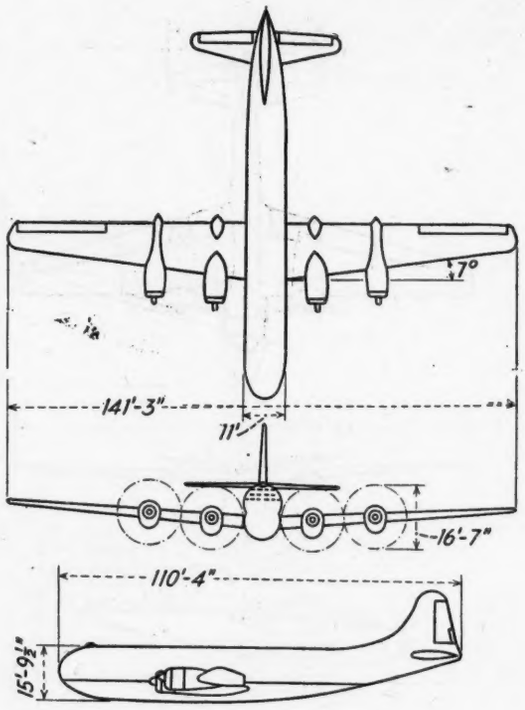
Now in large scale production for executive and feederline transport operations with choice of powerplants. With two 400-hp. P & W's high speed is 226 mph. and cruising is 198. Its 286-gal. fuel capacity gives range of 1,535 mi. With two 500-hp. Continentals high speed is 231 mph., cruising is 219, and range is 1,300 mi.



Boeing Stratocruiser

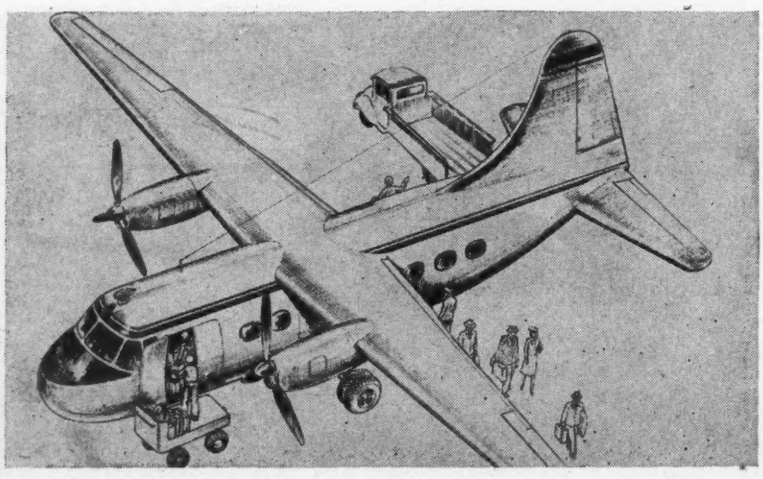
Peacetime development of C-97 now being produced for Panam. Carrying up to 100 passengers and powered by four P & W R-4360 Wasp Majors of 3,500 hp. each, craft has high speed of about 400 mph., cruising of 340 at 23,500 ft., and service ceiling of 30,000 ft. Fuel capacity of 7,055 gal. gives range of 3,500 mi.

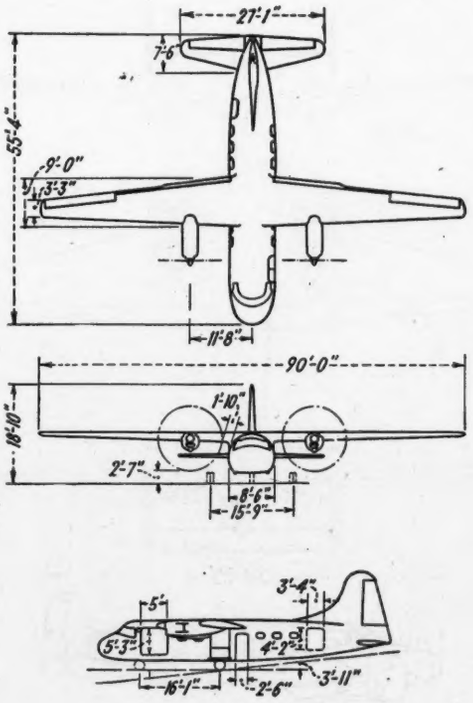


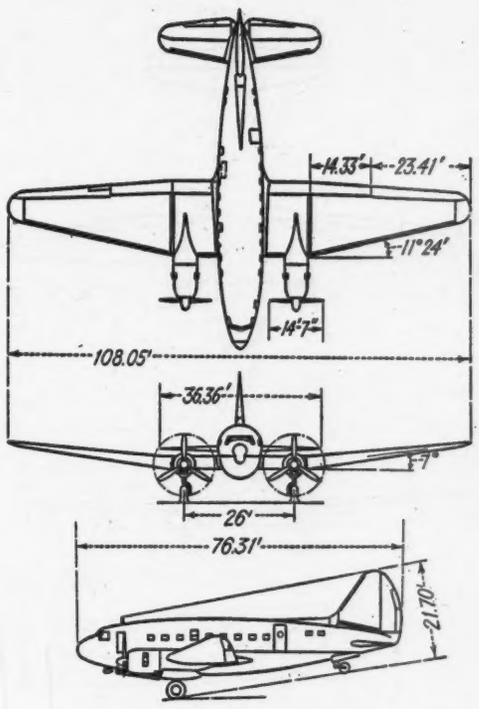


Boeing 417

A 20-passenger and cargo design developed for feederline operations. Powered by two 700-hp. Wrights or Rangers, estimated high speed would be 243 mph., cruising speed 200, and range from 200 to 600 mi. depending on payload. Maximum design payload is 6,190 lb., and gross wt. of all-metal craft is set at 18,400 lb.

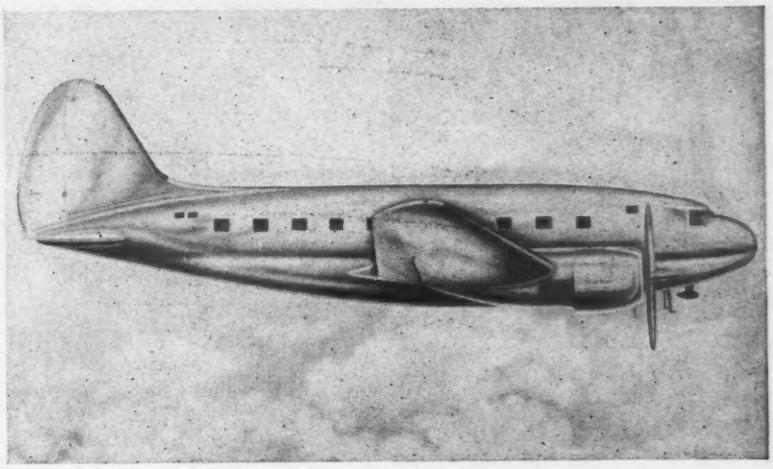


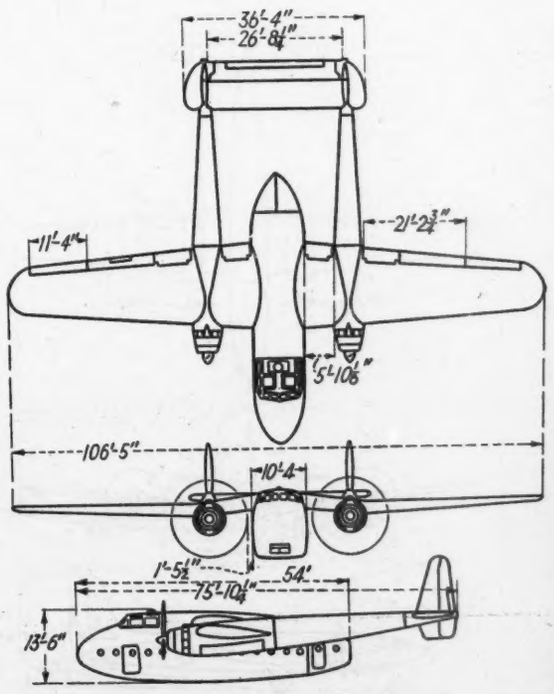




Curtiss-Wright CW-20E

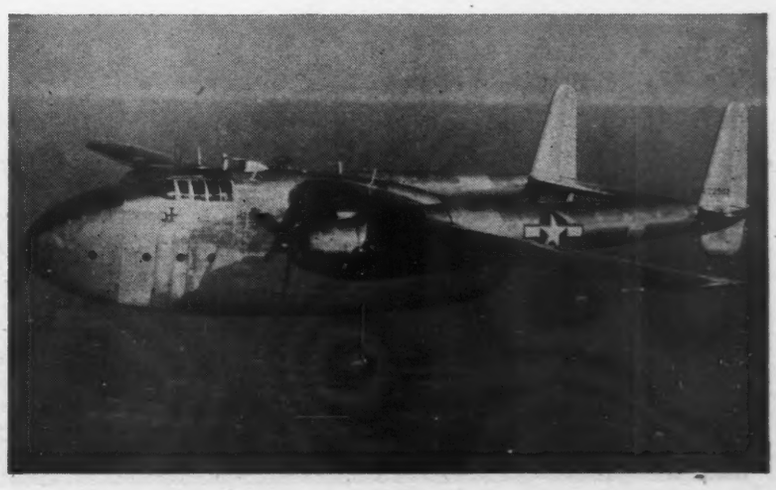
Peacetime development of C-46 Commando, powered by two Wright R-3350's of 2,200-hp. each, giving high speed of over 265 mph. and cruising speed of 242 mph. at 10,000 ft. Depending on seating arrangements, passenger capacity can be varied from 36 to 42, with crew of three or four. Gross wt. is 48,000 lb.





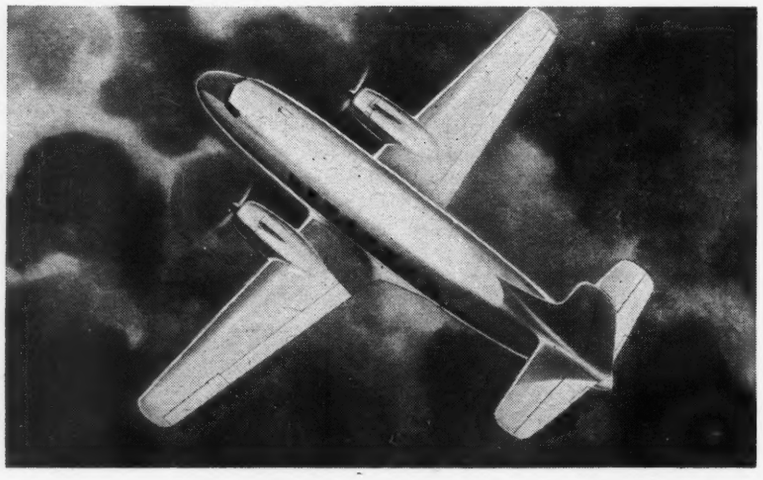
Fairchild C-82 Packet

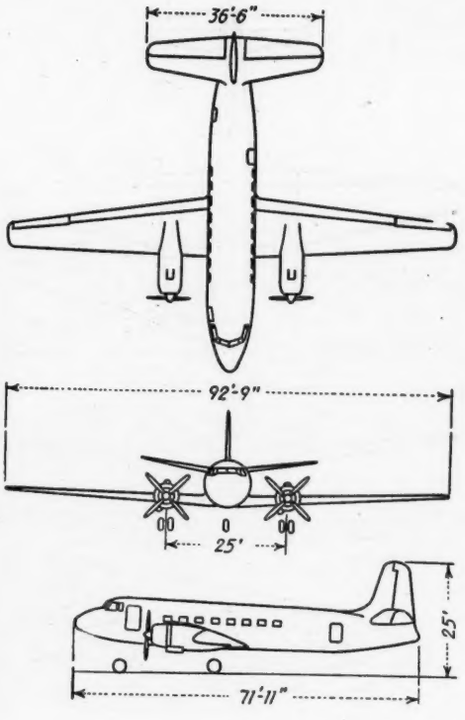
First aircraft in America designed specifically for cargo carrying, it has cubic capacity about equal to rail freight car. Powered by two 2,100-hp. R-2800 P & W's, it has high speed of 244 mph. at 17,500 ft., cruising speed of 200 at 10,000 ft. at 60% METO and service ceiling of 25,000 ft.



Martin 202

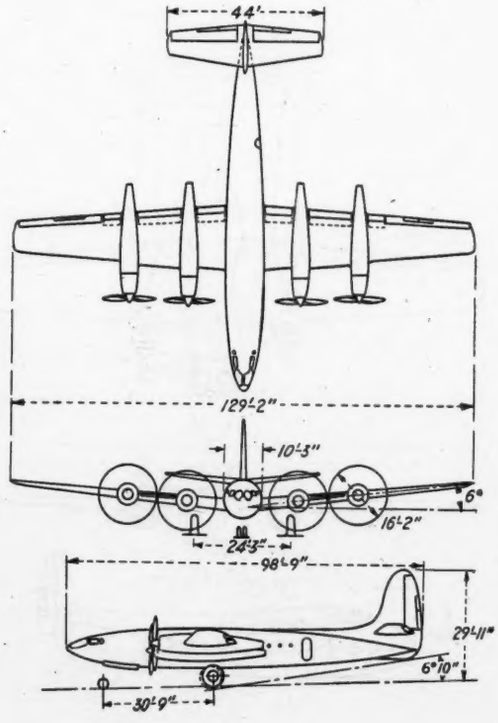
Ordered by four major airlines for domestic operations, this new design will carry from 30 to 42 passengers and cargo. With two P & W R-2800's of 2,100-hp. each, craft will have high speed of 306 mph. at 8,500 ft., cruising speed of 270 at 10,000 ft. and, with fuel capacity of 625 gal., a range of 700 mi.

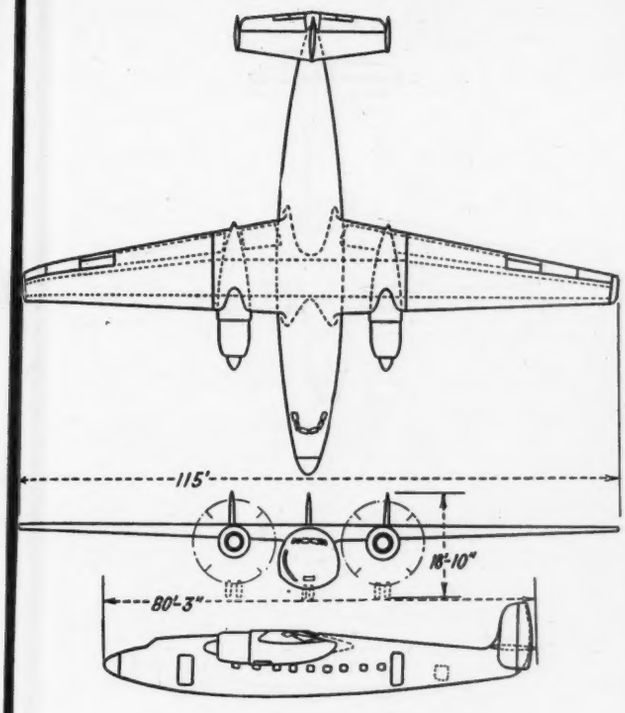




Republic Rainbow

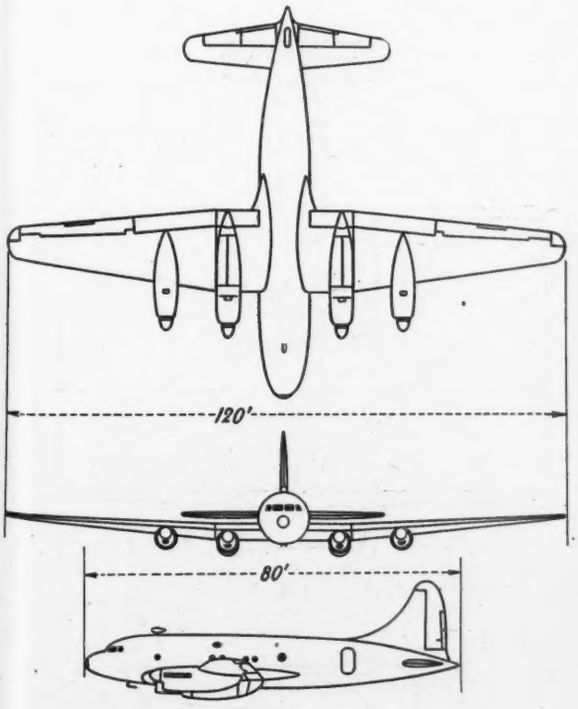
Commercial version of XF-12 photo-reconn plane, this ultra high speed long range luxury transport is on order by Panam. Its four P & W Wasp Majors give high speed of 450 mph. at 40,000 ft. and cruising speed of over 400 at same altitude. Carrying 46 passengers, its 5,570-gal. fuel capacity gives a range of 4,100 mi.





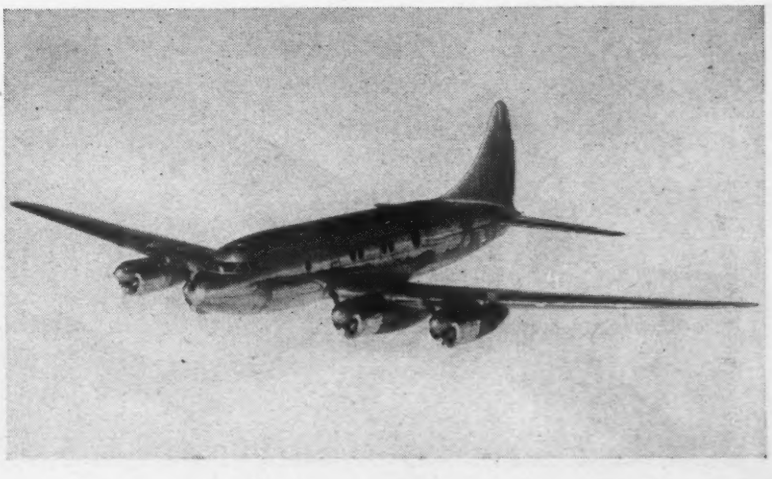
Airspeed Ambassador

Now under construction, this 28-36 place feederliner will be powered by two 2,000-hp. Bristol Centaurus engines. Laminar-flow wings and tricycle landing gear are features. At 45,000 lb. gross weight, carrying 9,000 lb. payload, cruising speed at 20,000 ft. is given at 240 mph., and range at 1,000 mi. Cabin allows 50 cu. ft. of space per passenger.



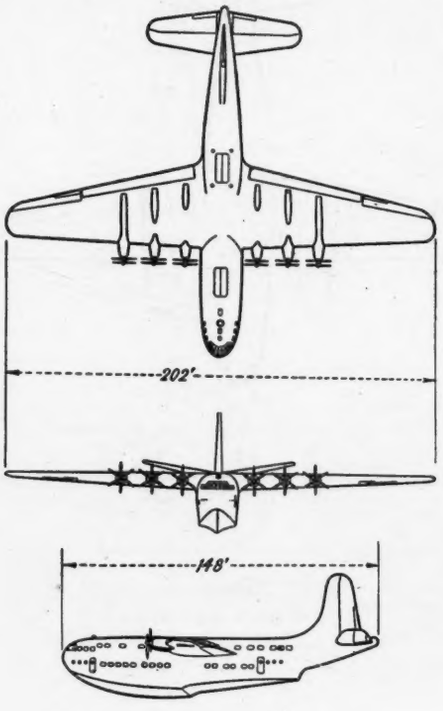
Avro Tudor I

Slated for North Atlantic run, with production already underway for BOAC. Top speed for this 12-24 seater is given at 345 mph., cruising 290, and range as 5,000 mi. at 20,000 ft. A pressurized cabin is fitted, and engines are four Rolls-Royce Merlins. Span is 120 ft., length 80 ft., and gross weight 76,000 lb. Wing loading is 54 lb./sq. ft. Normal fuel capacity is 3,460 gal.



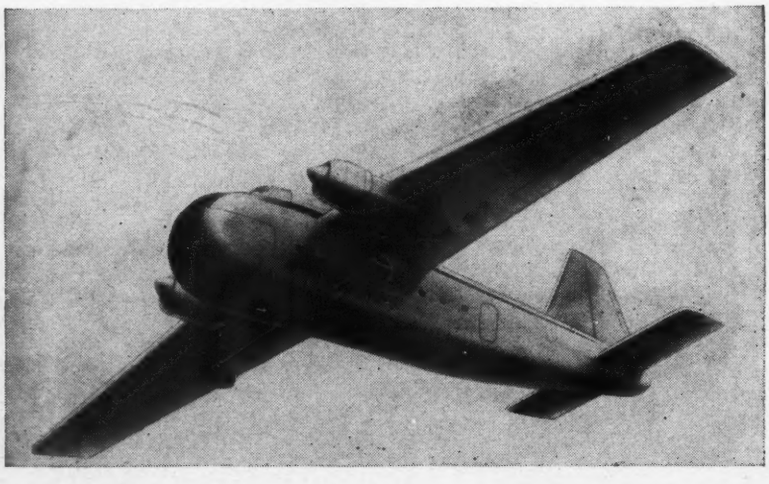
Blackburn Clydesman

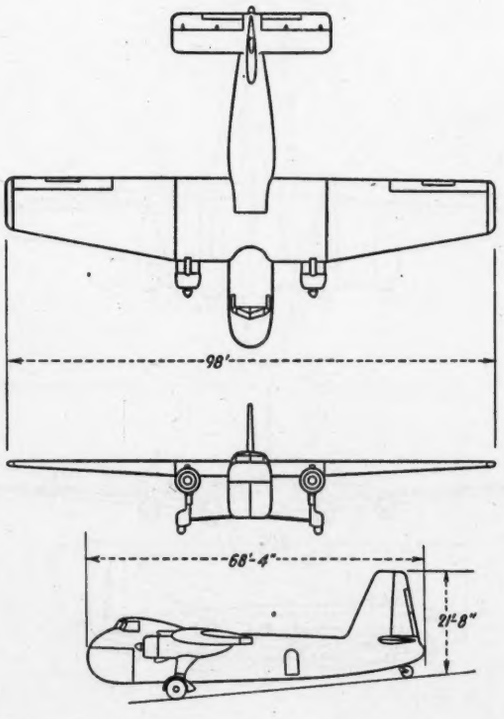
Projected 155-ton flying boat would carry up to 160 passengers in pressure cabin. Six unspecified engines, possibly using jet exhaust assisted thrust, would turn six-blade contra-rotating props. Span is given as 202 ft., length 148 ft. Range at 269 mph. would be 2,500 mi. Sea level top speed is estimated at 307 mph., and average cruising speed at 269 mph.

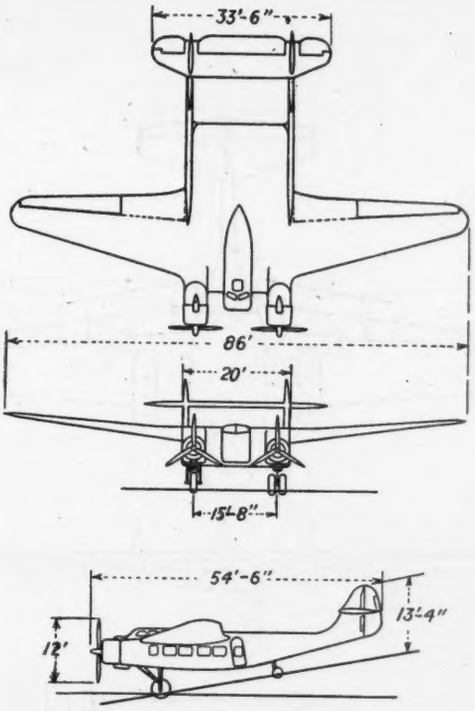


Bristol Freighter

Designed as a short range cargo carrier with a payload of about five tons. Two Bristol New Perseus engines of 1,175 hp. each will give an estimated 170-mph. cruising speed, and 67-mph. landing speed. Wing loading is placed at 21.3 lb./sq. ft. Design has been deliberately simplified so as to give maximum freight space and to bring down operating costs.

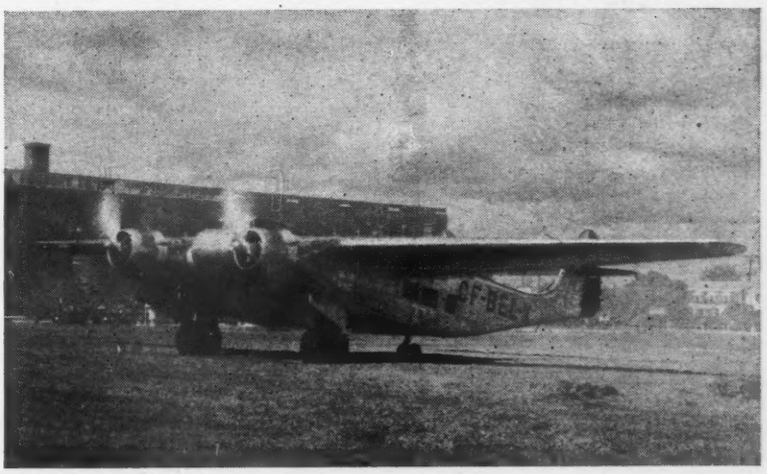


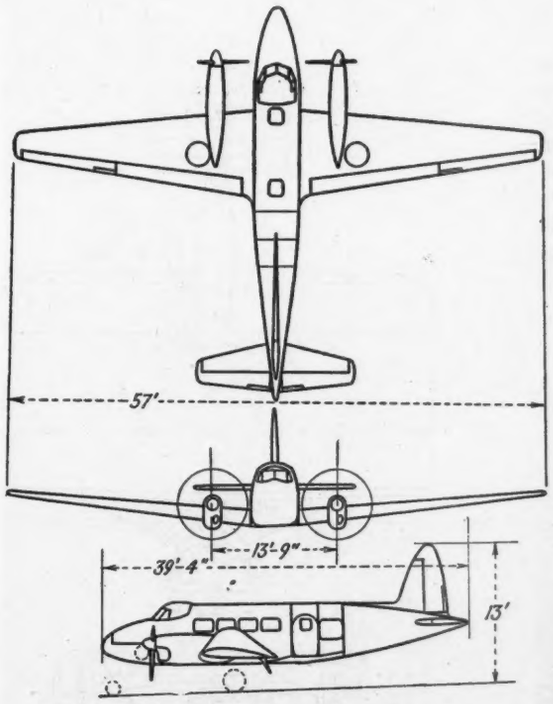




Burnelli CBY-3

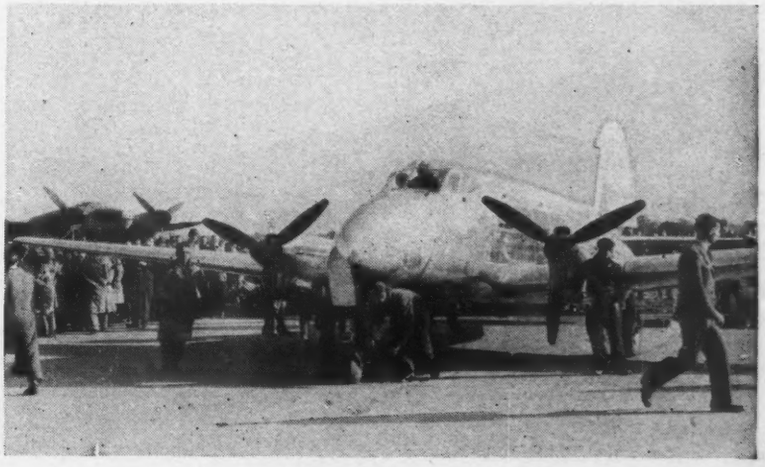
Designed in Canada especially for operating in rugged territory, all-metal P&W-powered transport weighs 27,000 lb., and is designed for 5-6 ton disposable load. Airfoil-shaped fuselage is claimed to provide 30% of total lift. In addition to seating for 24 passengers, there is also 700 cu. ft. of cargo space. Embodied are dual landing gear and duplicate hydraulic system.





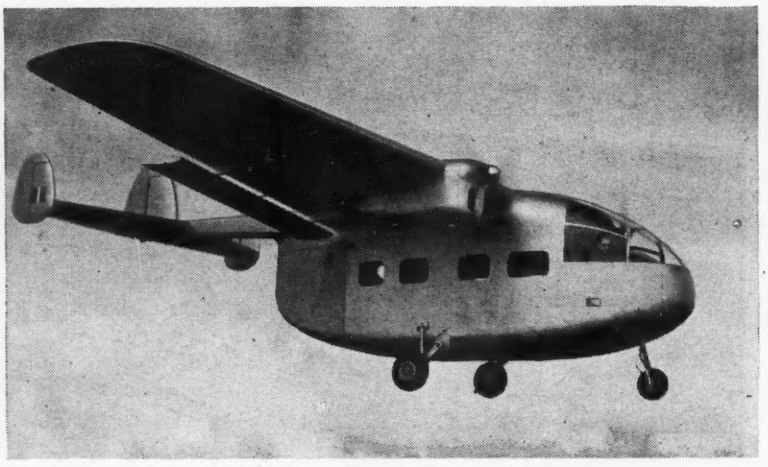
DH 104 Dove

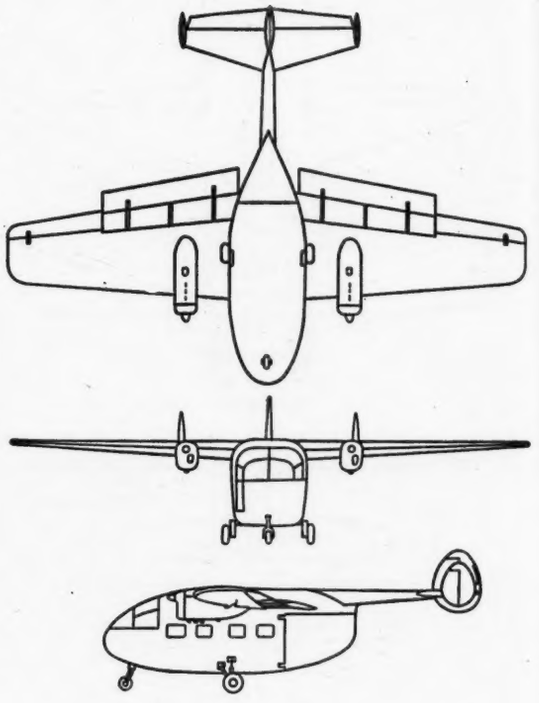
All-metal 8-11 place feederliner especially designed for low operating costs. Two 330-hp. DH Gipsy engines fitted with reversible pitch props give a top speed of 218 mph. at 7,200 ft. with maximum range at 1,000 mi. Span is 57 ft., length 39 ft. 4 in., and gross wing area 335 sq. ft. Cruising fuel consumption is put at 21 gal./hr. Production has been started.



Miles M.57 Aerovan

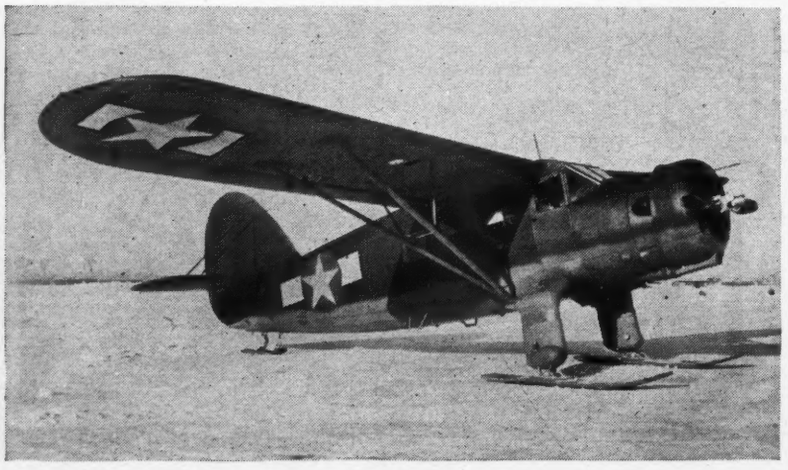
All-wood light passenger and cargo carrier powered by two 150-hp. Cirrus Major 4-cyl. engines, giving 130-mph. top speed and range of about 450 mi. Six-eight-ten passengers or one ton payload. Fixed tricycle landing gear, metal tail boom. Wing area 400 sq. ft.

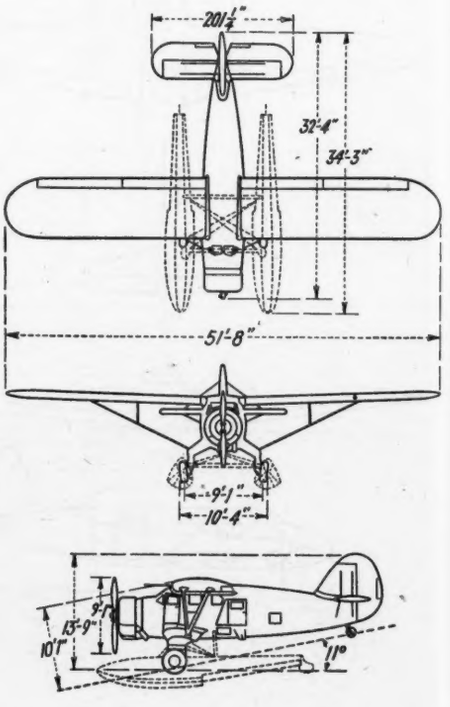


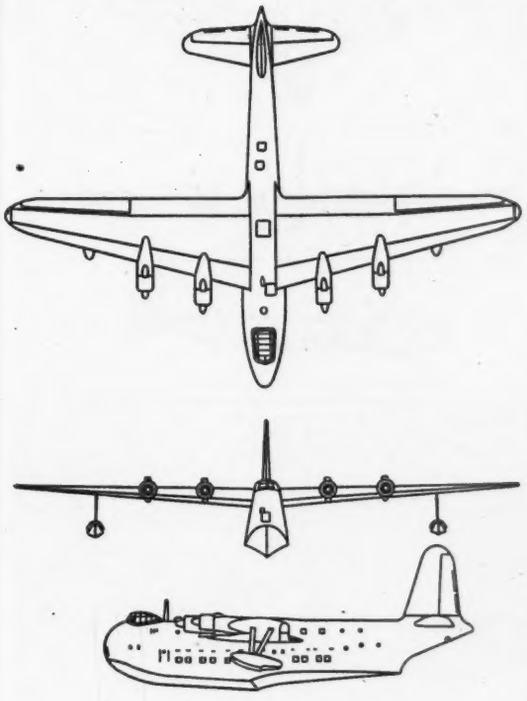


Noorduyn Norseman V

A light, rugged transport built to operate in rough country, this 6-8 passenger monoplane is powered by a 600-hp. P&W Wasp. Construction is wood, steel tube, and fabric covering. Disposable load for landplane is 3,160 lb., for seaplane, 2,880 lb. Cruising speed is 141 mph., landing speed 68 mph., and service ceiling 17,000 ft.

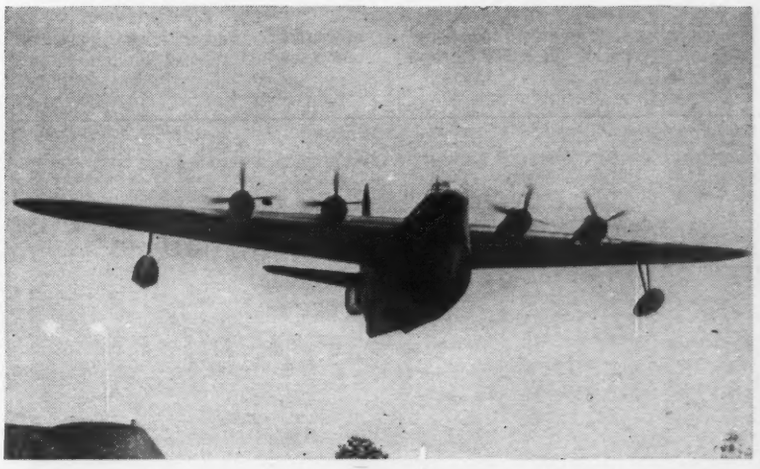


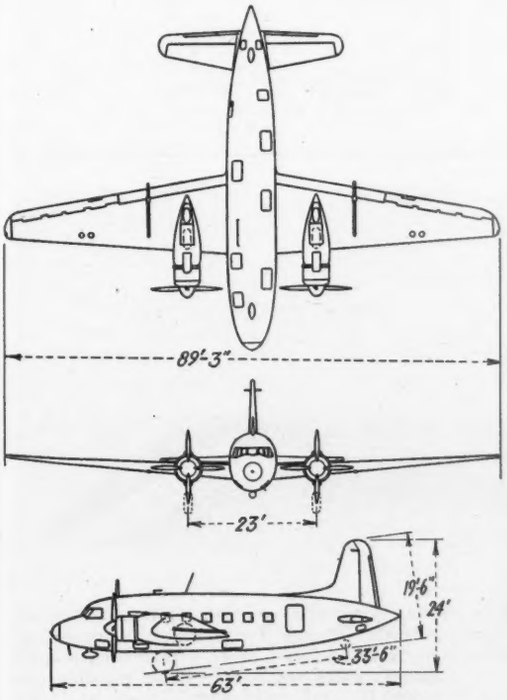




Short Shetland

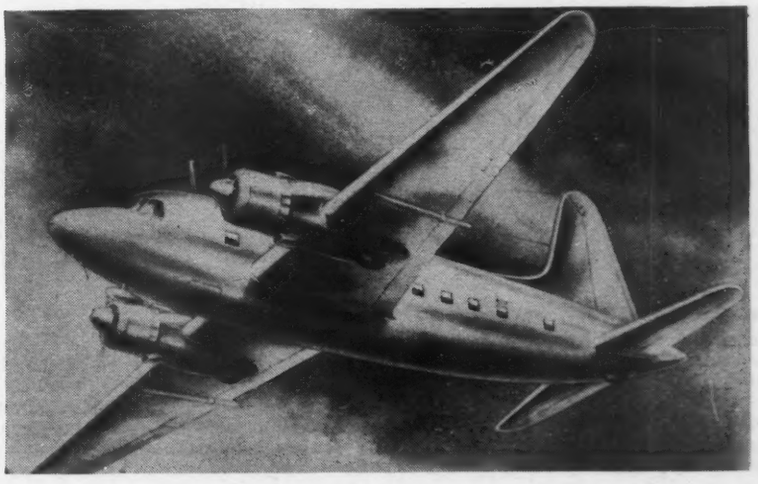
Designed initially for patrol service with RAF as a Sunderland replacement, it is a joint Short and Saunders-Roe design, weighing 130,000 lb. loaded, and powered by four 2,500-hp. Bristol Centaurus engines. Accommodations are for 70 passengers on long range routes, or 40 by day and 24 by night in de luxe fashion. Span is 150 ft. and climb, 675 fpm. at sea level.

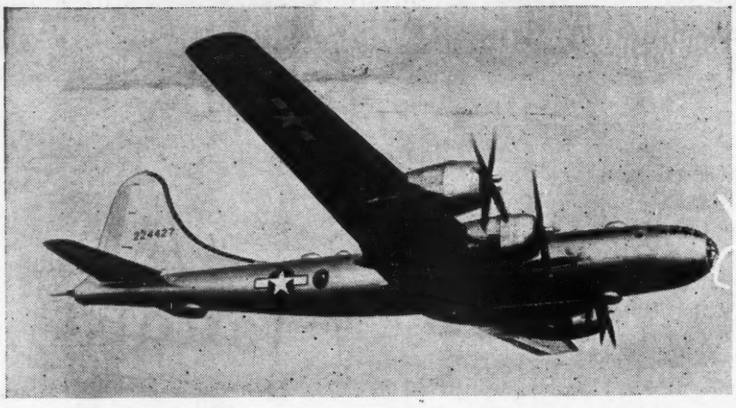


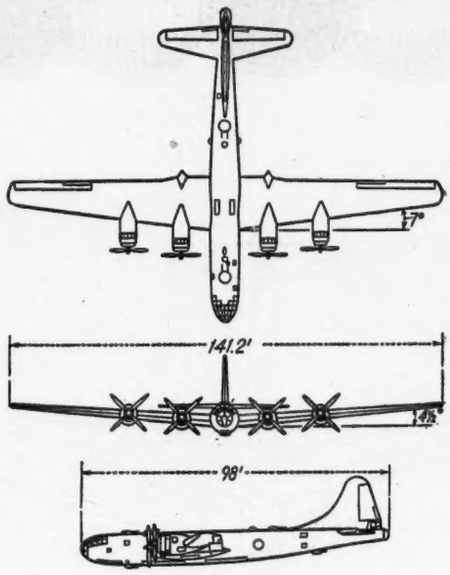


Vickers Viking V.C.1

Now in quantity production in two versions, a 27-passenger standard, and a 21-24 de luxe, both types powered by two 1,675-hp. Bristol Hercules. Featured are flexible wing mountings to eliminate vibration. Basically developed from Warwick, construction is all metal with stressed skin covering. Gross weight is 34,000 lb., range, with 750 gal., 1,500 mi.

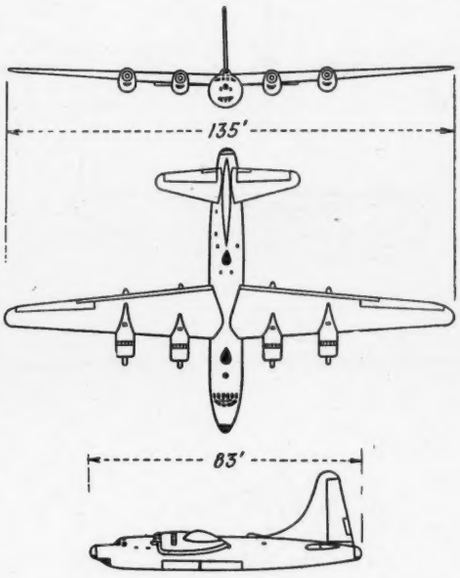






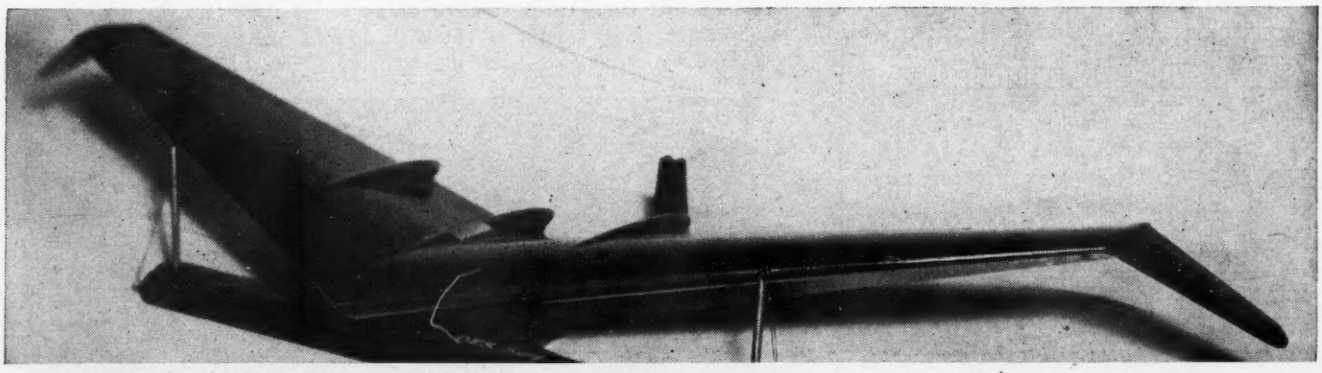
Boeing B-29 Superfortress

Generally credited with delivering knockout blows against Japan, 65-ton craft was AAF's first pressurized bomber. Powered by four 2,200-hp. Wright R-3350s, top speed is over 350 mph. Plane has broken several long distance nonstop records. Late versions have no turrets, higher speeds, greater bomb capacity, and longer range.



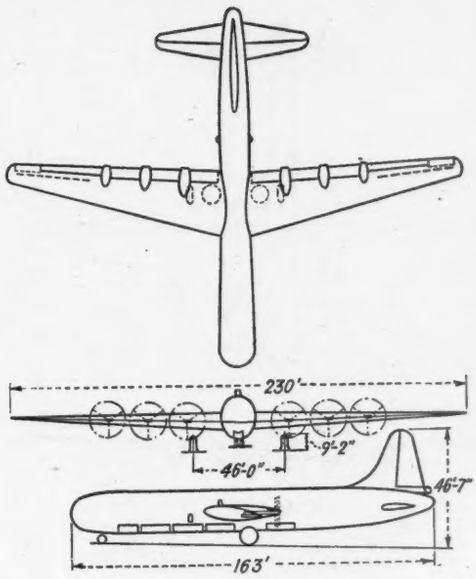
Convair B-32

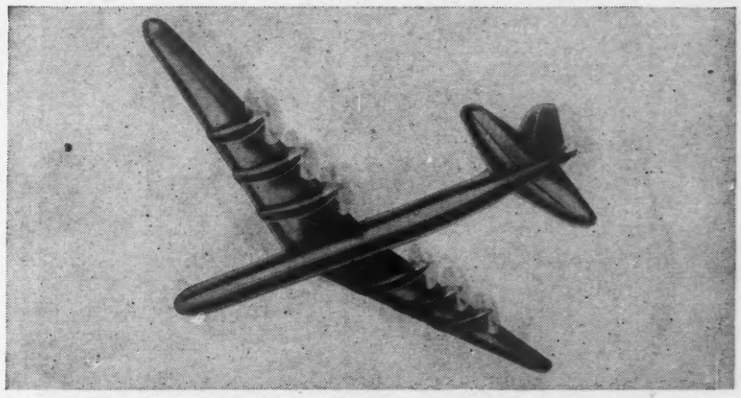
Although an entirely new design, craft still bears some of company's famed B-24 features, notably narrow Davis wing. Power is four Wright R-3350s of 2,200 hp. each, turning four-blade Curtiss reversible pitch props. High altitude top speed is over 350 mph. Span 135 ft., length 83 ft. High wing loading of 84.3 lb./sq.ft. has been achieved.



Northrop XB-35 Flying Wing

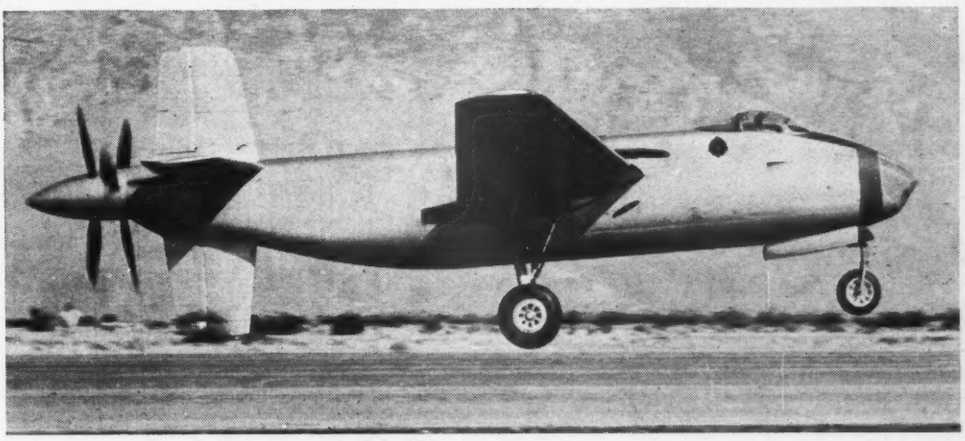
Scheduled for flight tests soon, this very long range bomber is result of much intensive research which has been carried out by company on smaller scale types such as N9M, XP-56, XP-79 and others. Powered by four pusher mounted P&W Wasp Majors of over 3,500 hp. each, span is 172 ft., length 51 ft. Retractable tricycle landing gear. Photo shows a model displayed to press at Wright Field, which is believed to depict an early stage in development of XB-35. Gross weight is approximately 90 tons. Control surfaces are composed of elevons—combination elevators and ailerons. Armament consists of remote control turrets. Except for engines, mounted in separate nacelles, craft presents extremely smooth lines, with everything possible enclosed in wing. Although no data has been released on performance, craft will probably be in same class with Convair's XB-36.

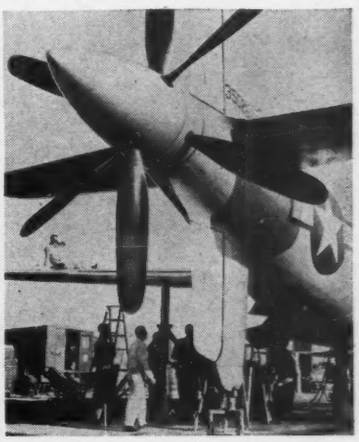




Convair XB-36

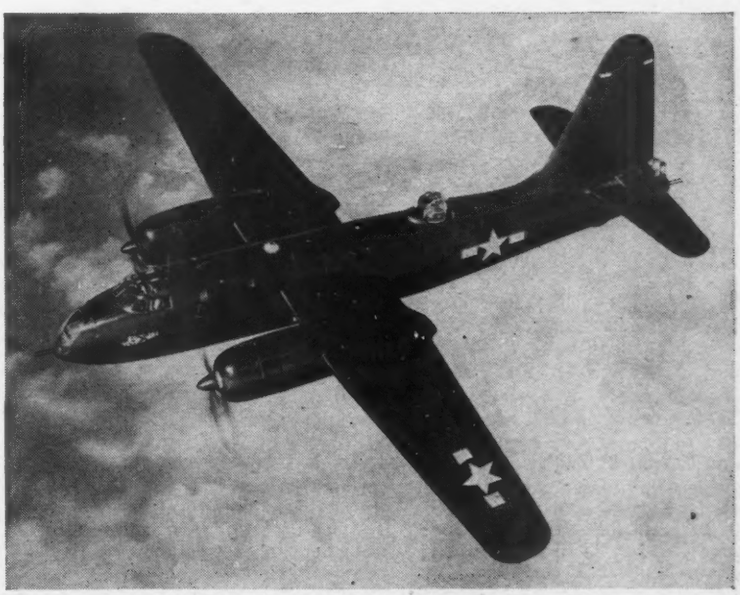
Designed gross weight is over 250,000 lb., and range will be over 10,000 mi. Six P&W Wasp Majors of over 3,500 hp. each are mounted as pushers. Pressurized fuselage is 12 ft. 6 in. diameter, rudder is 46 ft. from ground. Crew of 17. Span 230 ft. length 163 ft. Tires weigh 1,500 lb. each. Craft is scheduled for test flights soon.





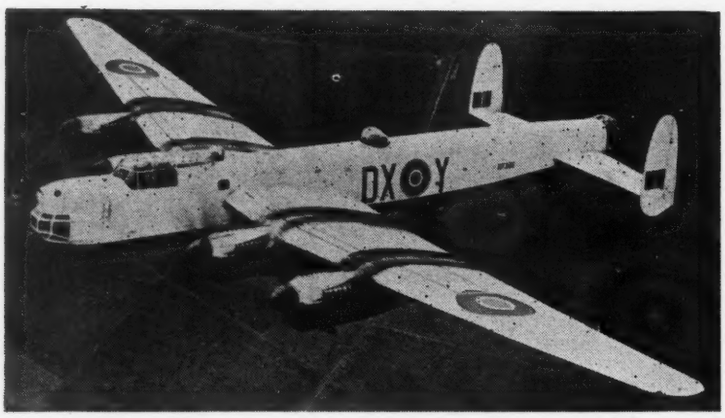
Douglas XB-42

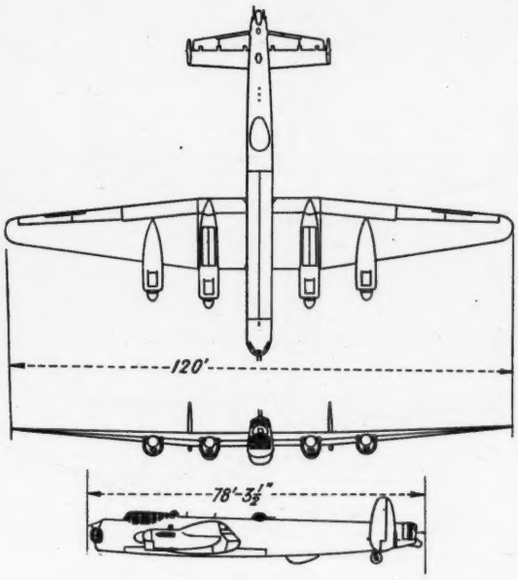
Cross-country record breaker is AAF's latest bomber and features unusual power plant installation, with engines in fuselage and props behind tail. Two Allison V-1710s at 1,600 hp. each give the craft a top speed of over 400 mph. A commercial version, DC-8, is planned, to carry 6-ton payload for 300 mi. and 48 passengers.



Lockheed P2V-1 Neptune

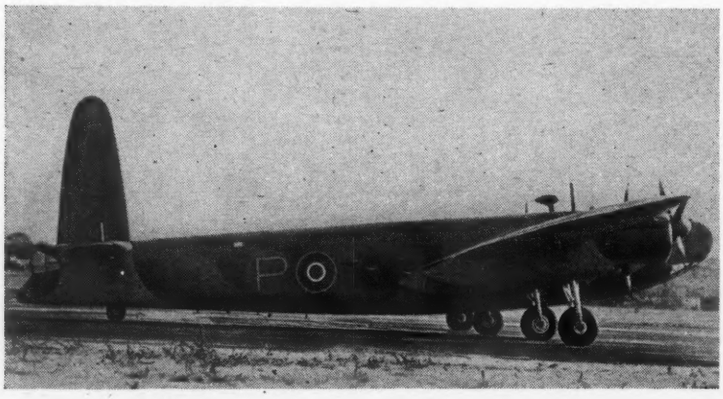
New Navy search plane and patrol bomber powered by two 2,300-hp. Wright R-3350-8 Duplex Cyclones has a top range of over 5,000 mi. Span is 100 ft., length 75 ft. 6 in., height 28 ft. 1 in., and wing area is 1,000 sq. ft. Wing loading is 58 lb./sq.ft. and power loading is 16.1 lb./hp. Six 20-mm. cannon can be fitted in nose, plus twin .50-cal. guns in mid-upper and tail turrets. Speed is stated to be well over 300 mph. As a bomber bomb bay can hold atomic missiles, two 2,165-lb. torpedoes, four 11.5-in. "Tiny Tim" rockets, sixteen 500-lb. bombs, eight 1,000-lb. or four 2,000-lb. bombs, or twelve 325-lb. depth charges. Sixteen 5-in. rockets can be mounted under wings. Equipment is also carried for photo and radar mapping. Landing gear is retractable tricycle. Present contracts call for 100 P2Vs. Gross weight is 58,000 lb.

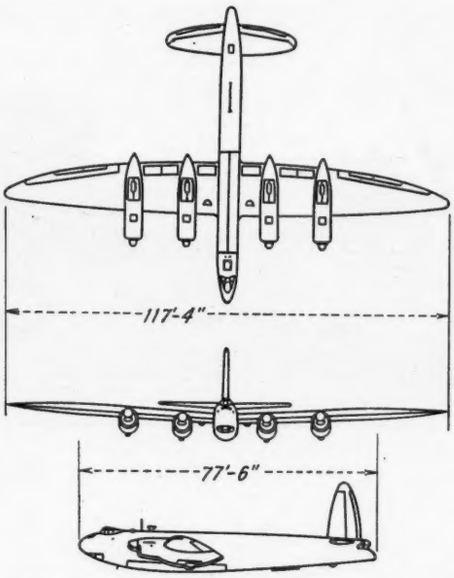




Avro Lincoln I

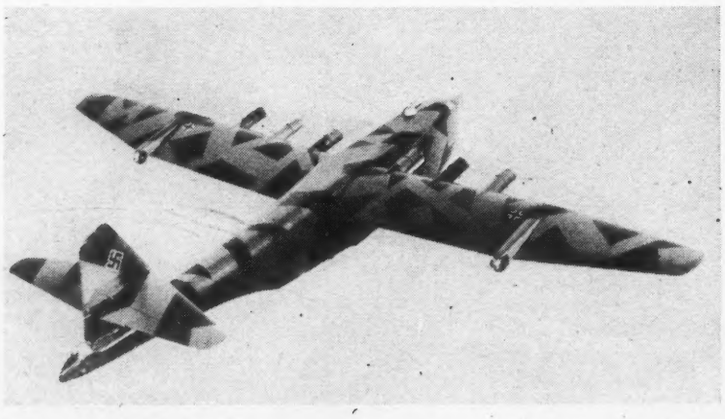
Similar to Lancaster, but larger, this craft carries same bomb load faster for longer distances. Four Rolls-Royce Merlins at 1,750-hp. each turn four-blade props. Loaded weight is given at 75,000 lb. Six .50 cal. guns are mounted, with two in nose remote control turret. Span is 120 ft., length 78 ft. 3½ in., and height 17 ft. 3½ in.

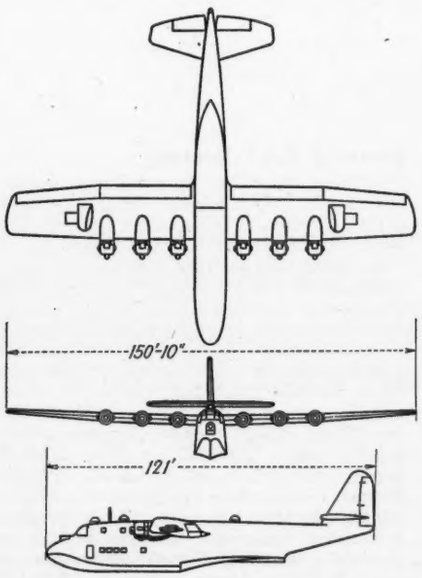




Vickers Windsor B.1

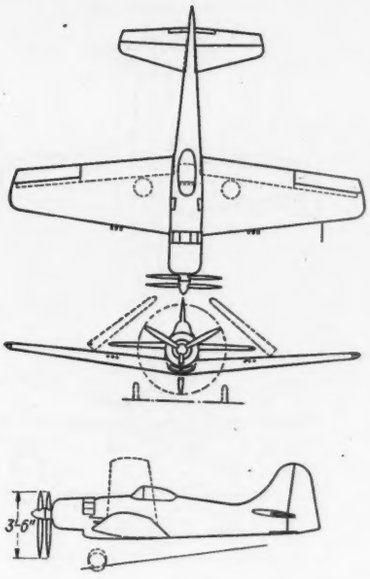
RAF's latest heavy bomber came out too late to see combat. Of geodetic construction, fabric covered, engines are four Rolls-Royce 85s. Span is 117 ft. 4 in., length 77 ft. 6 in. Feature is four wheel landing gear with separate leg for each engine nacelle, giving tread of 50 ft. Covering is interwoven with wire and has glass cloth backing.

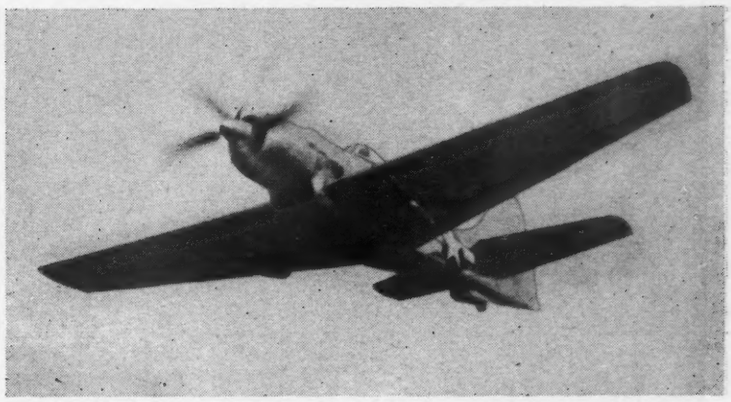




Blohm & Voss By-238

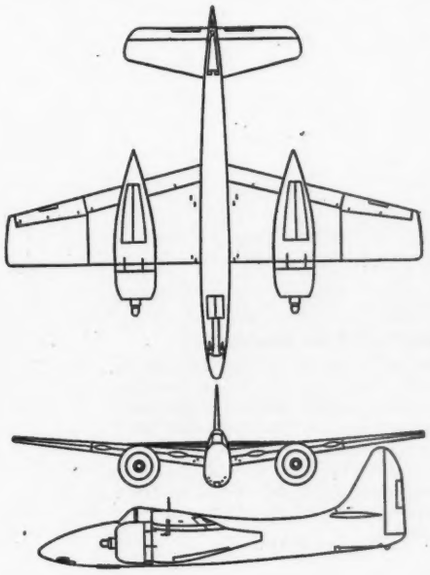
Considerably larger and heavier than By-222, gross weight is 198,000 lb., span 197 ft., with center section chord at 23 ft. Power plants are six Jumo 222 engines. Gun turrets, in nacelles, are built in wings' leading and trailing edges. Top speed at 15,700 ft. is 241 mph. Wing floats are retractable. Another version has six 1,750-hp. DB 603s.





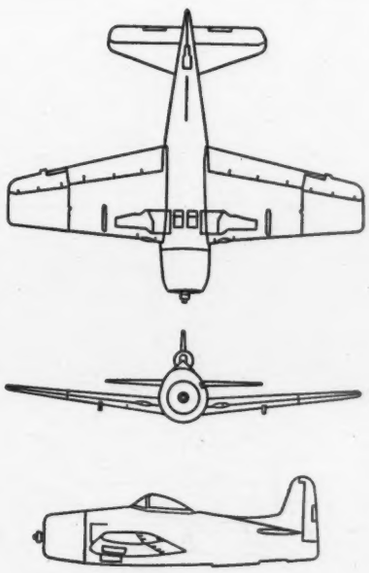
Boeing XF8B-1

Powered by P&W Wasp Major at over 3,500 hp., turning six-blade contra-rotating prop, latest Navy fighter is single seater of very long range capable of carrying torpedoes, bombs, and six cannon or machine guns. Speed well over 450 mph. Features power egg for easy maintenance and "parcel" radio equipment.



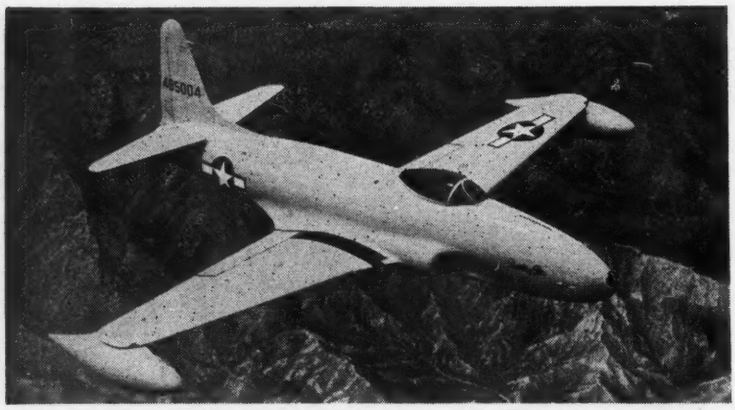
Grumman F7F-3 Tigercat

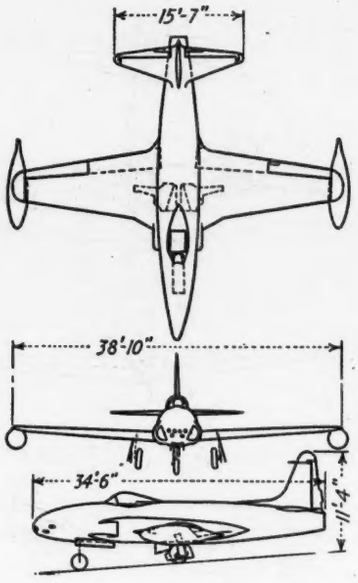
Navy's first twin-engine fighter with tricycle landing gear to go into service. Two P&W Double Wasp engines of 2,100 hp. each give top speed of over 425 mph. Cannon, machine guns, rockets, and bombs or torpedoes make up armament. A two-place version carries radar for night fighting. Climb is over 4,000 fpm.



Grumman F8F-1 Bearcat

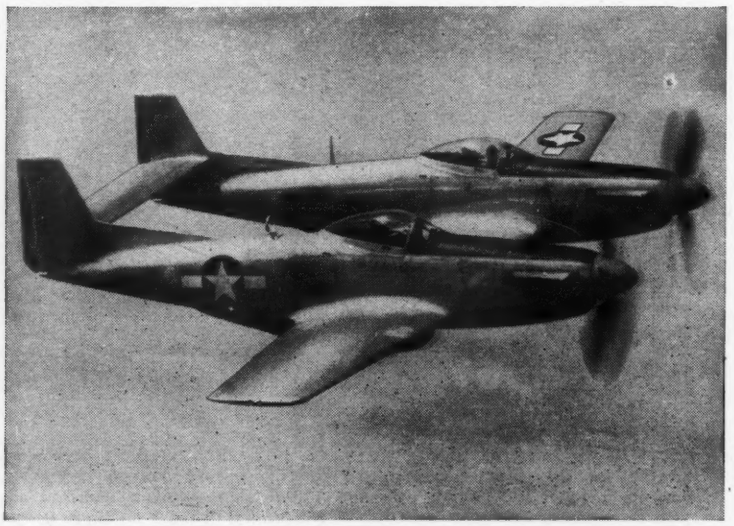
Developed from F6F Hellcat, this newer model is lighter, faster and more maneuverable. Powered by 2,100-hp. P&W Double Wasp, speed approaches 500 mph., and climb nearly 5,000 fpm. Span 35 ft. 6 in., and gross weight 9,300 lb. New features include bubble canopy, and inwards retracting landing gear. Produced too late to see combat.





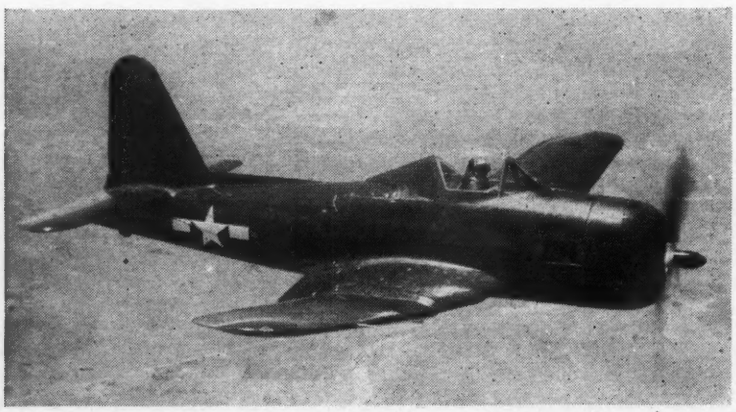
Lockheed P-80A Shooting Star

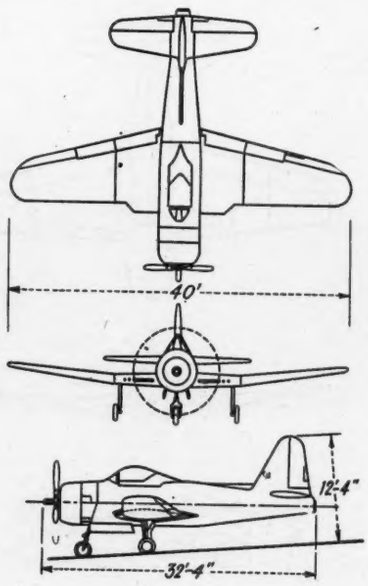
Powered by GE I-40 jet turbine, craft is marked by unusually fine finish and streamline. Top speed is over 550 mph. Interchangeable noses allow conversion to high speed reconn. work. Pressure cabin is fitted. Span is 38 ft. 10 in., length 34 ft. 7 in. Droppable wing tanks of 165-gal. capacity each. Six 50-cal. guns fitted in nose.



NAA P-82 Twin Mustang

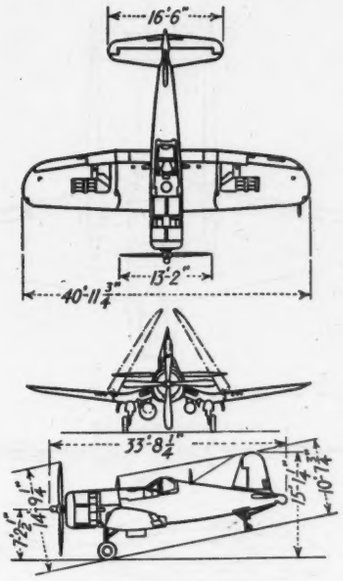
New and novel long range fighter is result of mating two P-51s, increasing range, speed, and military load. Powered by two Packard-built Merlins at better than 2,000 hp. each, top speed is over 480 mph., and range over 3,000 mi. Dual controls permit pilots to fly shifts on long missions.

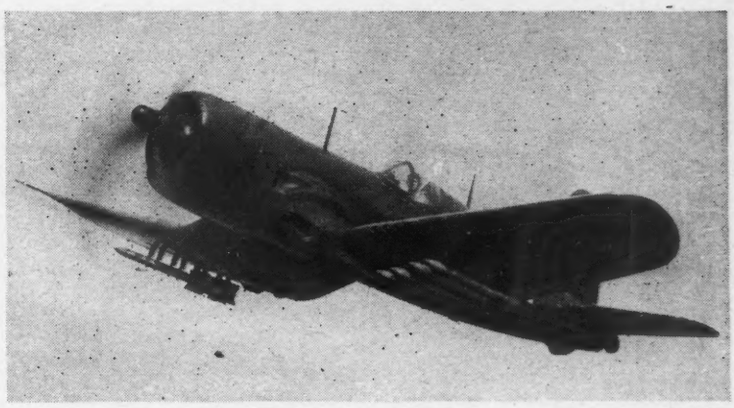




Ryan FR-1 Fireball

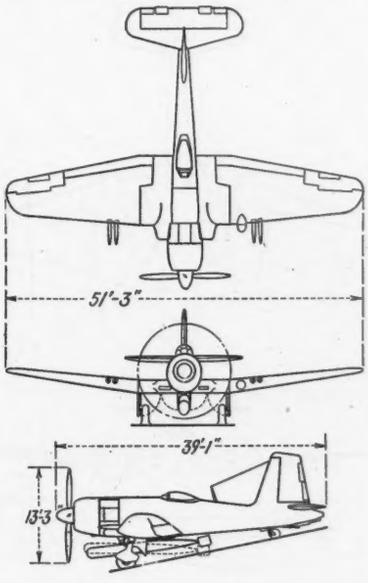
Navy's first jet fighter also has reciprocating engine in nose, a Wright R-1820 at 1,350 hp. Turbine is GE I-16 mounted behind pilot. Combination gives craft good maneuverability, speed, and range characteristics. Top speed on either is over 300 mph., combined, craft does over 425 mph. AAF has taken delivery on several FR-1s.

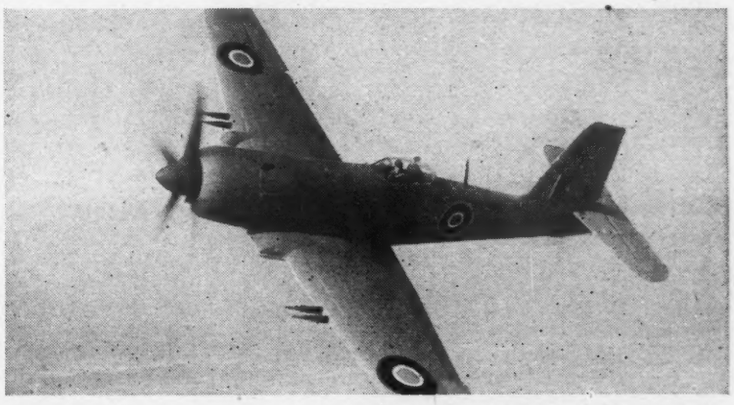




Vought F4U-4 Corsair

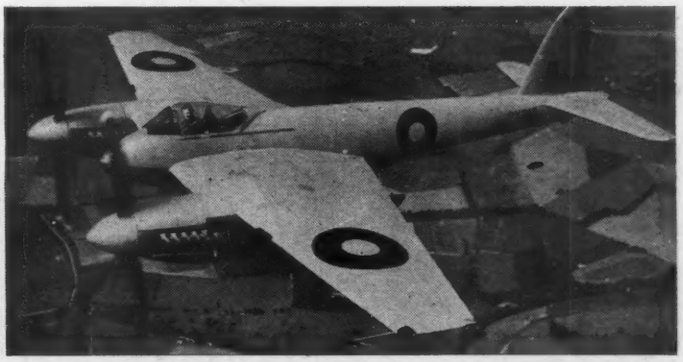
Latest modification has increased climb and speed over previous models. Engine is P&W Double Wasp of 2,100 hp. turning four-blade prop. Other modifications include bubble type canopy and fewer and larger cowl flaps. Top speed, over 450 mph. One ton of bombs can be carried, and range is over 1,500 mi. Armament six .50-cal. guns.





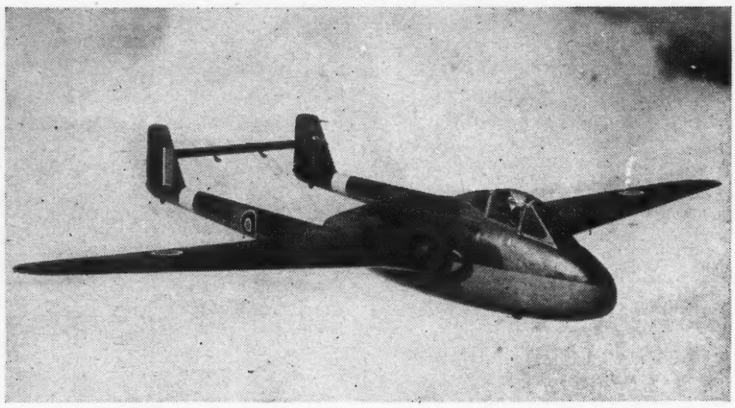
Blackburn Firebrand T.F. 4

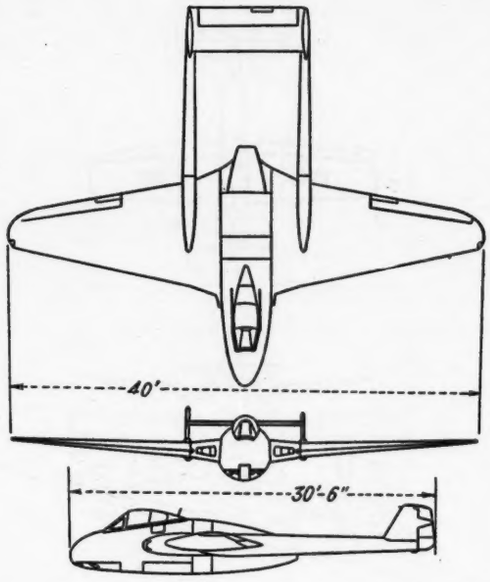
Designated strike-fighter, Royal Navy's latest combat type carries torpedo in adjustable sling. Powered by a Bristol Centaurus at 2,500 hp., gross weight is 15,670 lb. Span 51 ft. 3 in., and length 39 ft. 1 in. Top speed at sea level is 320 mph. Armament is four 20-mm. Hispano cannon. Wing folding is by manual means.



DH 103 Hornet

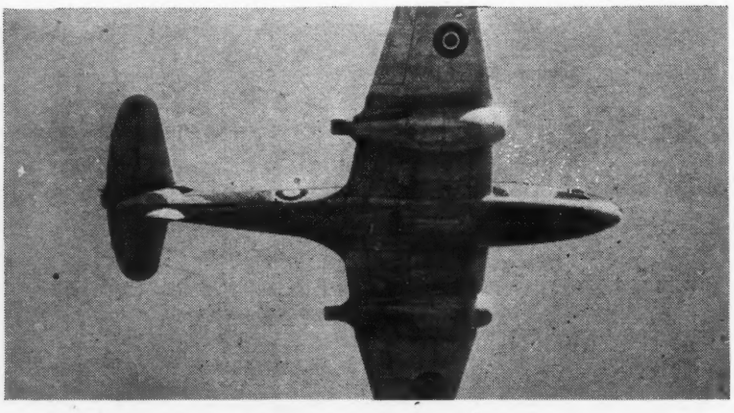
A long range fighter developed from Mosquito and powered by two 2,070-hp. R-R Merlins, this single seater is credited with a 470-mph.-plus top speed and climb of over 4,500 fpm. Composite design wing is made up of wood and metal ribs and wood and metal covering. Span 45 ft., length 34 ft. 6 in., and gross weight 15,000 lb.

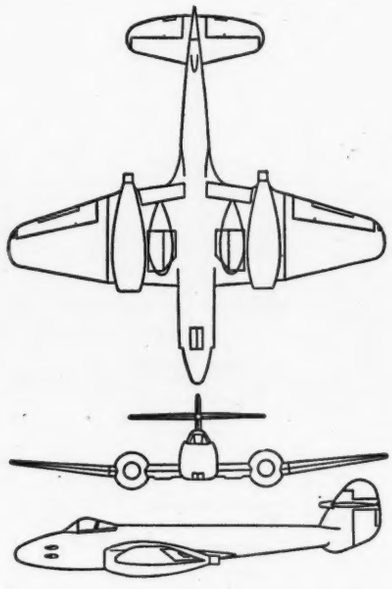




DH 103 Vampire

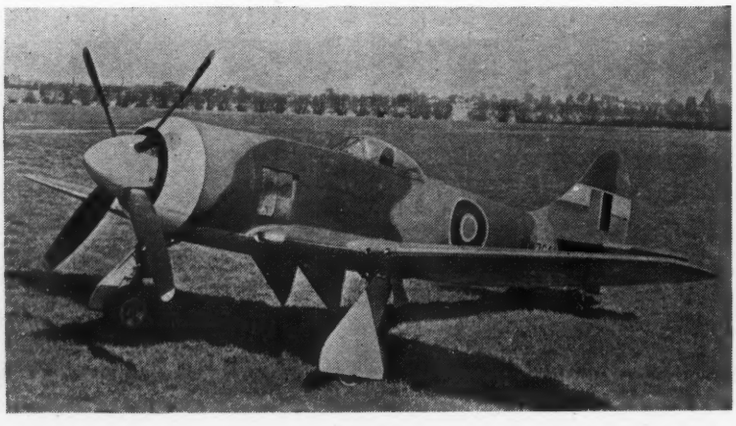
Twin-boom interceptor is powered by a DH Goblin turbine. Construction is all metal except for wood carapace cockpit. Craft was first in Britain to exceed 500-mph. Span is 40 ft., length 30 ft. 6 in., height 9 ft. 9 in., and wing area is 258 sq. ft. Naval version is Sea Vampire with 32-lb. wing loading and folding wings.

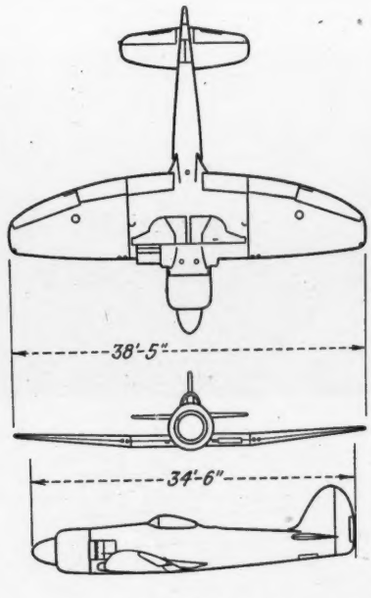




Gloster Meteor F.4

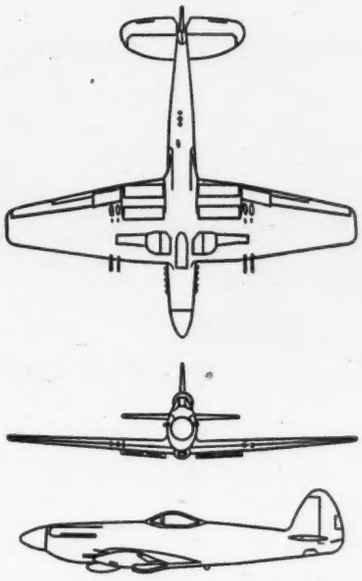
Powered by two R-R Derwent 5 turbo-jets, a specially-prepared version of this standard RAF fighter recently broke World's speed mark at 975.675 km./hr. (about 606 mph.). Span is 43 ft., length 41, and wing area 374 sq. ft. Four 20-mm. Hispano cannon are fixed in nose. First Allied jet fighter to see combat.

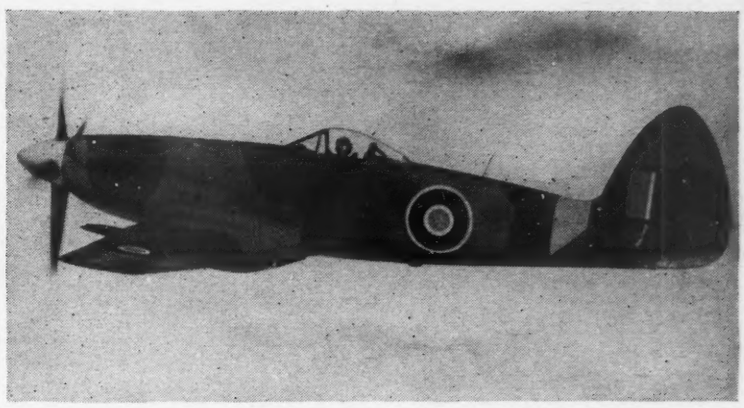




Hawker Fury F.1

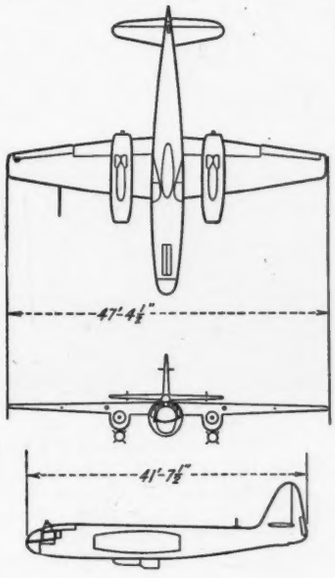
A development of Tempest 2, shown in photo, this craft has also been accepted by British Navy as Sea Fury. Powered by a 2,400-hp. Bristol Centaurus, top speed is given as over 460 mph., and range as over 1,000 mi. Naval type will have power-operated folding wings, jato. Span 38 ft. 5 in., length 34 ft. 6 in.





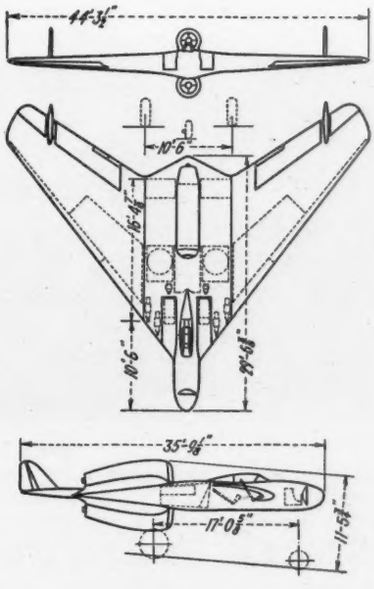
Supermarine Spiteful F.14

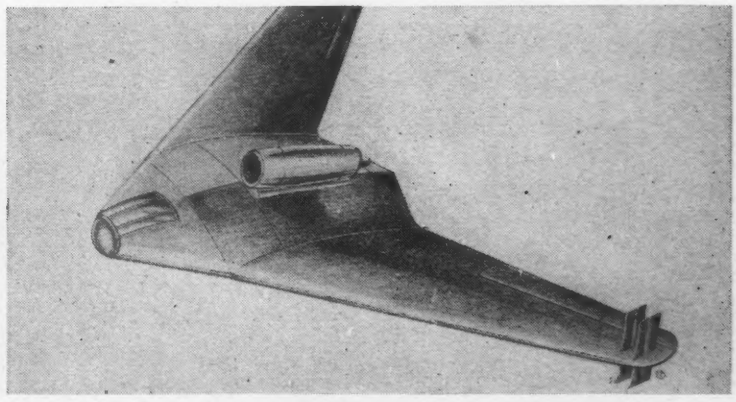
New fighter resembles famed Spitfire but has number of detailed changes, including laminar flow wings. Power is 2,050-hp. R-R Griffon, which gives 465-mph. top speed at 26,000 ft. Gross weight is 9,300 lb., span 35 ft., length 32 ft. 4 in. Naval version is called Seafang. Other models fitted with contra-rotating props.



Arado Ar-234

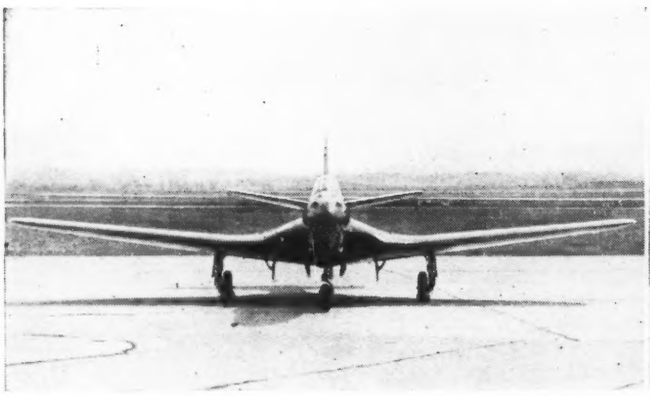
One-place bomber reconn. jet turbine powered, using two 004s which gave 470 mph. top speed. Span 47 ft. 4½ in., length 41 ft. 7½ in., and wing area 298 sq. ft. Fuel capacity 837 gal. Retractable tricycle landing gear, with all wheels folding into fuselage. Development was Ar-234C, using four BMW 003s and landing skids.





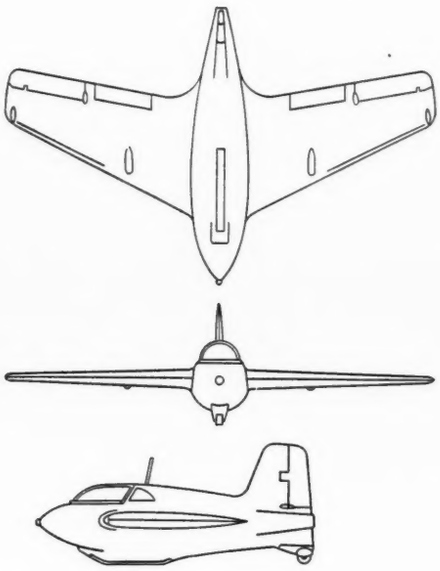
Gotha P-60

Two-and-three-seater versions were designed of this all-wing jet fighter, powered by either two BMW 003 or two Heinkel 011 engines. P-60A was to have 593 mph. top speed, P-60C speed of 625 mph. Leading edge flaps and elevons were to be used. Span of P-60C, 44 ft. 3½ in., length 35 ft. 9 in. Fitted with pressure cabins.



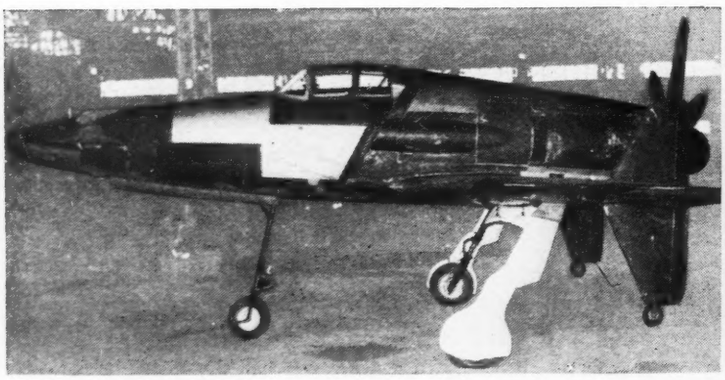
McDonnell FD-1 Phantom

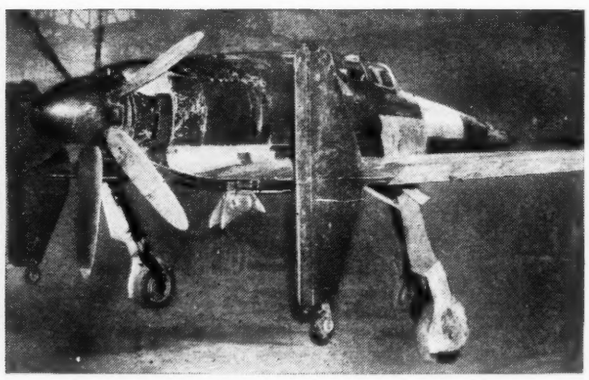
Navy's first straight turbo-jet-powered fighter — two Westinghouse axial units—and first with over 500 mph. speed. Service ceiling is over 37,000 ft. and range exceeds 1,000 mi. Span is about 40 ft., with wings folded is 16 ft. An all metal flush-riveted craft, gross wt. is under 10,000 lb. Twin turbojet engines are faired into wing roots.



Messerschmitt Me-163

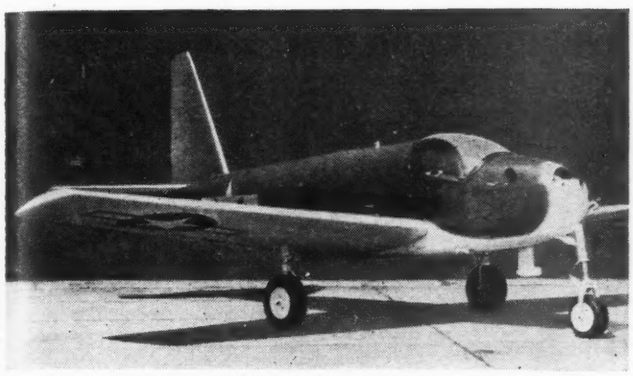
Nazi intereceptor powered by Walter 109.509 rocket motor has top speed of about 550, and climbs to 30,000 ft. in 2.6 min. Wooden wings and metal fuselage. Weight 9,500 lb. Wing area 186 sq. ft. Later model Me-163C has auxiliary rocket unit. top speed of 590 mph. and weighs 11,280 lb. Wheels dropped after takeoff.





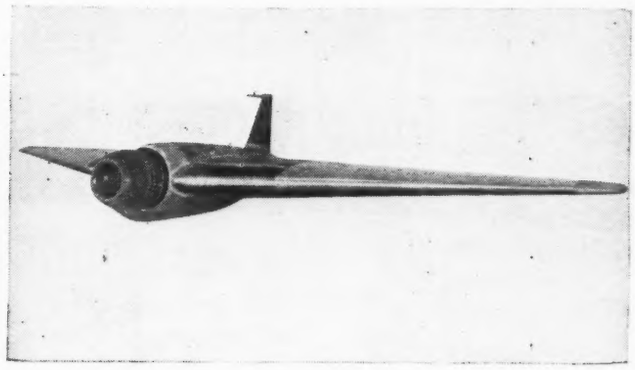
Mitsubishi J7W1 Shinden

New fighter type discovered by Intelligence officers on entering Japan. Powered by a 2,100-hp. engine turning one six-blade prop, top speed is given as 420 mph. at 20,000 ft. Four guns including two 30-mm. cannon. Tricycle retractable landing gear. Craft looks very much like Curtiss XP-55. Note use of extra wheels on vertical fins.



Culver LBE-1 Glomb

Navy glider-bomber is capable of carrying 4,000-lb. bomb and can be towed by a fighter. When released, control onto target is by radio control and television. Fixed tricycle landing gear. Pilotless missile is capable of attaining speed of 300 mph. and can withstand 4G diving speeds.

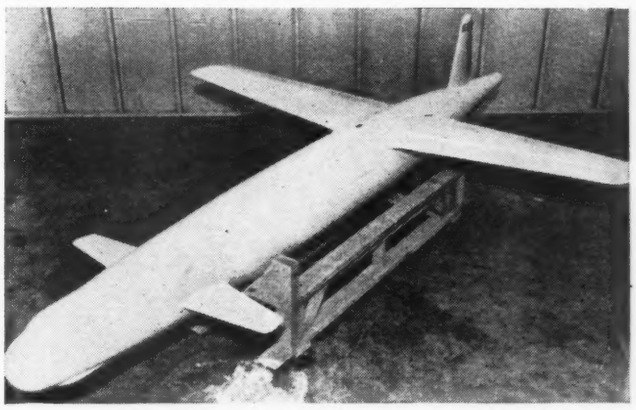


Northrop Flying Wing

Used by AAF with jet engine mounted in center of wing. Large magnesium castings inside wing carry 3,750-lb. explosive warhead. Engine is built by Ford, patterned on Nazi V-1 unit. Range of over 100 mi., top speed, over 350 mph. Fabricated of aluminum and magnesium.

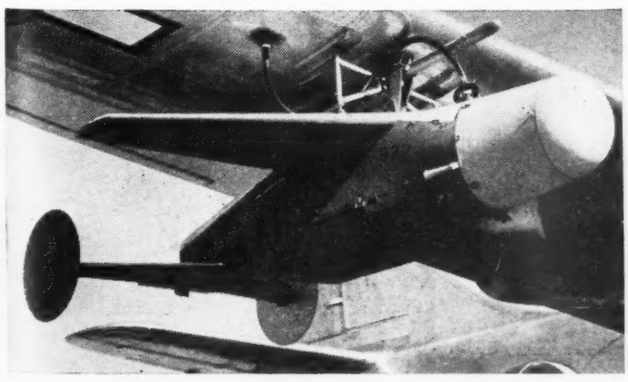
McDonnell LBD-1 Gargoyle

Jet-propelled missile developed for the Navy by McDonnell Aircraft Corp.—builders of FD-1 Phantom turbojet fighter—Gargoyle has 1,000-lb. warhead. Traveling at 600 mph. and electronically guided, it homes on its target much like a dive bomber. Note "butterfly" type tail surfaces.



Gorgon

Canard type jet-propelled missile developed by Naval Air Materials Unit, Johnsville, Pa., which contains 100-lb. warhead and travels at approximately 550 mph. It can be carried to vicinity of target by a bomber and, after launching, guided to the target by radio or homing device.



Navy Bat Bomb

Twelve-foot long missile is carried, one beneath each wing, by Convair PB4Y-2 Privateer search planes. This is claimed to be first fully automatic guided missile to have been used successfully in combat, being used against Jap shipping. Launched outside of anti-aircraft fire.

Gorgon 1

Jet-propelled Navy missile has 11 ft. span, and length of 16 ft. A 100-lb. explosive package is carried in nose, and with top speed of 500 mph., can be controlled for 15-20 mi. radius. Acid-aniline engine. Direction is either by radio control or auto-target seeker.

Aviation's American Engine Specifications

Manufacturer	Model	Cooling system	Number of cylinders	Cylinder arrangement	Propeller drive	Rating: Rated hp.	Rating: At rpm.	Rating: At altitude (ft.)	Rating: Octane	Total dry weight without hub or starter	Lb. per hp.	Bore and stroke (in.)	Displacement (cu. in.)	Compression ratio	BMEP	Blower ratio	Dimensions: Diam. mount. ring or distance between bearers	Dimensions: Ht. or O.D. (in.)	Dimensions: Length without starter	Guar. fuel cons. at cruising hp.—lb./hp.hr.	Max. oil cons. at rated speed—lb./hp.-hr.	Valve mechanism	Cylinder construction	Make spark plugs supplied with engine	Type ignition	Make ignition	Make of carburetor	Make of starter	Are exhaust manifolds provided?	Shipping weight crated (lb.)	C. A. A. license number
Aircooled Motors Corp.	4A4-95-A3	A	4	Hopp	D	95	2600	SL	73	230	....	4 1/2 x 3 1/2	225	6.5	...	.....	10 3/8 x 12 1/8	21 29/32	30 11/16	.....	.....	Prr	Al, Ni	.....	M	Eise	Marvel	Del or Auto	No	.....	239
	4A4-100-B3	A	4	Hopp	D	100	2550	SL	80	230	....	4 1/2 x 3 1/2	225	6.5	...	.....	10 3/8 x 12 1/8	21 29/32	30 11/16	.....	.....	Prr	Al, Ni	.....	M	Eise	Marvel	Del	No	.....	238
	6A4-145-A3	A	6	Hopp	D	145	2600	SL	73	307	....	4 1/2 x 3 1/2	335	6.5	...	.....	10 5/8 x 18 1/8	21 29/32	40	.....	.....	Prr	Al, Ni	.....	M	Eise	Marvel	Del	No	.....	238
	6ALV335	AF	6	Vopp	.....	174	3000	SL	80	336	....	4 1/2 x 3 1/2	335	7.0	...	.....	.....	.....	.....	.....	.....	Prr	Al, Ni	.....	M	Eise	Marvel	Del	No	.....	Pnd.
	6A8-215-A3	A	6	Hopp	D	215	2600	SL	73	405	....	5 x 4 1/4	500	6.5	...	.....	16 1/4 x 20 5/8	30 5/16	45 17/64	.....	.....	Prr	Al, Ni	.....	M & B	.....	.....	Del	No	.....	Pnd.
	6A8-225-B3	A	6	Hopp	D	225	2500	SL	80	405	....	5 x 4 1/4	500	7.0	...	.....	16 1/4 x 20 5/8	30 5/16	45 17/64	.....	.....	Prr	Al, Ni	.....	M & B	.....	.....	Del	No	.....	Pnd.
	6A8-215-57F	AF	6	Hopp	D	215	2500	SL	80	466	....	5 x 4 1/4	500	7.0	...	.....	16 1/4 x 20 5/8	27 3/4	66	.....	.....	Prr	Al, Ni	.....	M & B	.....	.....	Del	No	.....	Pnd.
Allison Div., Gen'l Motors	V1710-E22	L	12	V	2.23:1	1100	3000	28000	100	1660*	1.45	5 1/2 x 6	1710	6.65	170	7.23:1	18 3/8	40 17/64	210	.46	.25	O	WS	Ch	M	Scint	St	.....	No	2122	.....
	V1710-G3	L	12	V	2.36:1	1600	3200	SL	100	1475	.90	5 1/2 x 6	1710	6.5	231	7.48:1	18 3/8	38 3/4	93	.43	.18	O	WS	Ch	M	Scint	St	.....	No	2205	.....
	V1710-E23	L	12	V	2.77:1	1820	3200	SL	100	1439	.80	5 1/2 x 6	1710	6.65	263	8.1:1	18 3/8	38 5/8	83 1/8	.41	.025	O	WS	Ch	M	Scint	St	.....	No	2122	.....
	V3420-A18	L	24	W	3.13:1	2600	3000	25000	100	2655	1.02	5 1/2 x 6	3420	6.65	200	6.9:1	24 1/2	37 31/32	96 11/64	.45	.025	O	WS	Ch	M	Scint	St	.....	No	3300	.....
Continental Motors Corp.	A-65 Series 8	A	4	Hopp	D	65	2300	SL	73	170	2.62	3 7/8 x 3 5/8	171	6.3	...	.....	.....	22 9/16	30 21/32	.5	.010	Prr	S	Ch	M	Eise	St	.....	No	245	205
	C75 Series 12	A	4	Hopp	D	75	2275	SL	73	191	2.55	4 1/16 x 3 5/8	188	6.3	...	.....	.....	21 1/4	31 5/8	.515	.010	Prr	S	Ch	M	Eise	St	Delco	No	223	233
	C85 Series 12	A	4	Hopp	D	85	2575	SL	73	192	2.26	4 1/16 x 3 5/8	188	6.3	...	.....	.....	21 1/4	31 5/8	.515	.010	Prr	S	Ch	M	Eise	St	Delco	No	224	233
	A-100	A	6	Hopp	D	100	2350	SL	73	221	....	3 7/8 x 3 5/8	256	6.3	...	.....	.....	24 3/4	40 1/16	.....	.....	Prr	Al	Ch	M	Eise	St	Del-Remy	.....	.....	241
	C-115	A	6	Hopp	D	115	2350	SL	73	248	....	4 1/16 x 3 3/8	282	6.3	...	.....	.....	24 3/4	40 1/16	.....	.....	Prr	Al	Ch	M	B	Marvel	Del-Remy	.....	.....	236
	C-125	A	6	Hopp	D	125	2550	SL	73	248	....	4 1/16 x 3 5/8	282	6.3	...	.....	.....	24 3/4	40 1/16	.....	.....	Prr	Al	Ch	M	Scint	Marvel	Del-Remy	.....	.....	236
Diesel Power, Inc.	Model Thaheld	A	4	Hopp	D	125	2600	SL	...	235	....	4 7/8 x 3 7/8	290	16	...	.....	.....	.....	.....	.36	....	Prr	.....	None	Th	.....	.....	.....	.....	.....	.....
Gladden Products Corp. (Formerly Kinner)	K-5	A	5	Rad	D	100	1810	SL	73	304	3.04	4 1/4 x 5 1/4	372	5.1	118	.....	14	45 3/8	33	.55	.025	Prr	Al, S	BG	M	Scint	StHol	Eclipse	Op	600	3
	B-5 & B-54	A	5	Rad	D	125	1925	SL	73	312	2.50	4 5/8 x 5 1/4	441	5.25	117	.....	14	45 3/8	33	.55	.025	Prr	Al, S	BG	M	Scint	StHol	Eclipse	Op	600	51
	R-5 Series 2	A	5	Rad	D	160	1850	SL	73	335	2.10	5 x 5 1/2	540	5.50	127	.....	14	45 5/8	33.1	.55	.025	Prr	Al, S	BG	M	Scint	StHol	Eclipse	Op	600	153
	R-55	A	5	Rad	D	160	1850	SL	73	345	2.15	5 x 5 1/2	540	5.50	127	.....	14	45 5/8	33 5/8	.55	.025	Prr	Al, S	BG	M	Scint	StHol	Eclipse	Op	600	153
	R-56	A	5	Rad	D	160	1850	SL	73	362	2.26	5 x 5 1/2	540	5.50	127	.....	14	45 5/8	33 5/8	.55	.025	Prr	Al, S	BG	M	Scint	StHol	Eclipse	Op	600	153
Guiberson Diesel Engine Co.	A-1020	A	9	Rad	D	310	2200	SL	50	653	2.1	5 1/16 x 5 1/2	1021	14	110	.....	20	47 1/8	33 3/8	.370	.021	Prr	Al, S	.....	Th	.....	.....	.....	No	.....	220
Jacobs Aircraft Engine Co.	R-755-A	A	7	Rad	D	300	2200	SL	80	505	1.68	5 1/4 x 5	757	6	143	.....	16 1/2	44	40 7/32	.450	.025	Prr	S	.....	M&B	Scint	St	Eclipse	No	.....	237
	R-755 (L-4 Series)	A	7	Rad	D	225	2000	SL	73	505	2.2	5 1/4 x 5	757	5.4	118	.....	16 1/2	44	40 7/32	.530	.018	Prr	S	.....	M-M&B	Scint	St	Eclipse	No	.....	121
	R-915 (L-6 Series)	A	7	Rad	D	300	2100	SL	80	555	1.8	5 1/2 x 5 1/2	914	6	124	.....	16 1/2	45 5/8	40 1/16	.535	.025	Prr	S	.....	M-M&B	Scint	St	Eclipse	No	.....	195
Lycoming Div., Aviation Corp.	O-145-B2	A	4	Hopp	D	65	2550	SL	73	163.4	....	3 5/8 x 3 1/2	144.49	6.5	...	.....	8 1/2 x 10 1/4	20.59	24.62	.....	.....	Prr	.....	.....	M	.....	Scint	Marvel	No	206.4	210
	GO-145-C2	A	4	Hopp	27:17	75	3200	SL	73	196.39	....	3 5/8 x 3 1/2	144.49	6.5	...	.....	8 1/2 x 10 1/4	20.59	29.31	.....	.....	Prr	.....	.....	M	.....	Scint	Marvel	No	247.27	210
	O-235-A	A	4	Hopp	D	104	2600	SL	73	264.47	....	4 3/16 x 3 7/8	233.3	6.25	...	.....	11 1/2	25.20	31.54	.....	.....	Prr	.....	.....	M	Scint	Marvel	Del-Remy	No	488.58	223
	O-290-A	A	4	Hopp	D	125	2600	SL	73	272.83	....	4 3/16 x 3 7/8	289	6.5	...	.....	11 1/2	26.64	31.54	.....	.....	Prr	.....	.....	M	Scint	Marvel	Del-Remy	No	499.54	229
	O-350-A	A	6	Hopp	D	150	2500	SL	73	372.99	....	4 3/16 x 3 7/8	349.5	6.25	...	.....	14	26.54	39.09	.....	.....	Prr	.....	.....	M	Scint	Marvel	Del-Remy	No	426.70	227
	O-435-A	A	6	Hopp	D	190	2550	SL	73	379.37	....	4 7/16 x 3 7/8	434	6.5	...	.....	14	28.04	46.32	.....	.....	Prr	.....	.....	M	Scint	Marvel	Del-Remy	No	635.34	228
	R-680-E3A	A	9	Rad	D	285	2200	SL	87	515	....	4 5/8 x 4 1/2	680.4	7	...	1:1	19.25	43.5	37.5	.....	.....	Prr	.....	.....	M	Scint	Strom	.....	No	1041.3	202
Pratt & Whitney Div., United Aircraft Corp.	R-985-T13B	A	9	Rad	D	450	2300	SL	91	614	1.50	5 3/16 x 5 3/16	985	6	157	10	23 3/8	46.13	43.06	....	.025	Prr	AlS	.....	M	Scint	St	Op	No	.....	123
	R-985-SB3	A	9	Rad	D	450	2300	3500	91	682	1.70	5 1/16 x 5 3/16	985	6	157	10	23 7/8	46.13	43.06	....	.025	Prr	AlS	.....	M	Scint	St	Op	No	.....	123
	R-1340-S3H1	A	9	Rad	D	600	2250	3000	91	865	1.57	5 3/4 x 5 3/4	1344	6	157	10	23 7/8	51.81	43.0	....	.025	Prr	AlS	.....	M	Scint	St	Op	No	.....	143
	R-1340-S3H1-G	A	9	Rad	3:2	600	2250	3000	91	938	1.70	5 3/4 x 5 3/4	1344	6	157	10	23 3/8	51.81	47.81	....	.025	Prr	AlS	.....	M	Scint	St	Op	No	.....	142
	R-1830-S1C3-G	A	14	Rad	16:9	1200	2700	4900	91	1467	1.22	5 1/2 x 5 1/2	1830	6.7	192	7.15	27	49.19	61.16	....	.025	Prr	AlS	.....	M	Scint	St	Op	No	.....	106
	R-2000-25D13-G	A	14	Rad	2:1	1450	2700	1000	100	1595	1.10	5 3/4 x 5 1/2	2000	6.5	211	7.15 [1]	27	49.1	61.02	....	.025	Prr	AlS	.....	M	Scint	St	Op	No	.....	.....
	R-2800-CE15	A	18	Rad	2:1 [2]	2400 [3]	2800	SL	100	2339	.98	5 3/4 x 6	2804	6.75	243	760:1 [4]	30	52.8	78.4	....	.025	Prr	AlS	.....	M	Scint	St	Op	No	.....	.....
	R-4360-4	A	28	Rad	20:8.5	3000	2700	1500	100	3390	1.13	5 3/4 x 6	4362	7	201	7.52:1	.....	52.5	96.5	....	.025	Prr	AlS	.....	M	Scint	St	Op	No	.....	.....
Ranger Aircraft Engines Div., Fairchild Engine & Aircraft Corp.	6-440C-2	A	6	Lid	D	175	2450	SL	65	386	2.21	4 1/8 x 5 1/2	441	6	128	.....	17 7/8	33 1/2	53 5/32	.5	.020	Uhc	AlS	.....	M	Scint	St	.....	No	.....	216
	6-440C-5	A	6	Lid	D	200	2450	SL	87	386	1.93	4 1/8 x 5 1/2	441	7.5	146	.....	17 7/8	33 1/2	53 5/32	.44	.025	Uhc	AlS	BG	M	Scint	Marvel	.....	No	.....	216
	SGV-770C-1B	A	12	Vid	.667	450	3000	12000	91	760	1.68	4x5 1/8	773	6.5	154	9.5	13 3/8	34 1/8	66 61/64	.49	.025	Uhc	AlS	AC	M	Scint	St	.....	No	.....	232
	SGV-770C-2A	A	12	Vid	.667	500	3150	9000	100	757	1.52	4x5 1/8	773	6.5	163	8.84	13 3/8	34 1/8	66 29/64	.504	.020	Uhc	AlS	.....	M	Scint	St	.....	No	.....	232
	SGV-770D-1	A	12	Vid	.606	565	3300	8000	100	865	1.53	4x5 1/8	773	6.5	176	7.4	13 3/8	30 3/64	79 49/64	.53	.025	Uhc	AlS	.....	M	Scint	St	.....	No	.....	Pnd.
	SGV-770D-4	A	12	Vid	.458	465	3200	13500	100	896	1.96	4x5 1/8	773	6.5	149	7.14	13 3/8	36 3/4	77 1/4	.58	.020	Uhc	AlS	.....	M	Scint	St	.....	No	.....	Pnd.
Warner Aircraft Corp.	Scarab	A	7	Rad	D	125	2050	SL	73	285	2.28	4 1/4 x 4 1/4	422	5.2	115	.....	17	36 9/16	29	....	.025	Prr	S	Ch	M	Scint	St	.....	No	510	2
	Super Scarab	A	7	Rad	D	145	2050	SL	73	306	2.1	4 3/8 x 4 1/4	500	5.55	115	.....	17	36 9/16	29 3/4	....	.025	Prr	S	Ch	M	Scint	StHol	.....	No	540	104
	Super Scarab	A	7	Rad	D	165	2100	SL	73	341	2.06	4 5/8 x 4 1/4	500	6.4	123	.....	17 1/2	37 1/4	30 1/2	....	.015	Prr	S	Ch	M	Scint	StHol	.....	No	585	214
	Super Scarab	A	7	Rad	D	185	2175	SL	73	344	1.86	4 7/8 x 4 1/4	550	6.2	123	.....	17 1/2	37 1/4	30 1/2	....	.015	Prr	S	Ch	M	Scint	Hol	.....	No	614	235
Wright Aeronautical Corp.	R-760-E2	A	7	Rad	D	350	2400	SL	91	570	1.63	5 x 5 1/2	756	6.3	118	9.17	20	45	42.44	.485	.025	Prr	AlS	Op	M	Scint	St	Op	Yes	1080	155
	704-C9-GC	A	9	Rad	G	1200	2500	SL	91	1320	1.10	6 1/8 x 6 7/8	1823	6.7	152	7.14&10	24.5	55 1/8	50.04	.465	.025	Prr	AlS	Op	M	Scint	StHol	Op	No	2067	219
	C9GR-1820	A	9	Rad	G	1350	2700	SL	100	1323	.99	6 1/8 x 6 7/8	1823	6.55	154	7.13&10.4	24.5	55 1/8	47.29	.460	.025	Prr	AlS	Op	M	EdSplit	St	Op	No	.....	.....
	750C9HD	A	9	Rad	2.28:1	1425	2700	SL	100	1352	.85	6 1/8 x 6 7/8	1823	7.21	.....	.....	.....	56.77	47.69	.420	.02	Prr	.....	.....	M	Ed-Splt	St	.....	No	.....	.....
	C14GR2600	A	14	Rad	G	1900	2800	SL	100	2045	1.07	6 1/16 x 6 5/16	2603	6.90	152	7.06&10.6	28	54.08	66.08	.460	.025	Prr	AlS	Op	M	Bosch	St	Op	No	.....	.....
	C18GR3350	A	18	Rad	G	2200	2800	SL	100	2646	1.20	6 1/16 x 6 5/16	3347	6.85	146	6.06	38	55 3/4	76.26	.460	.025	Prr	AlS	Op	M	Scint	Ceco	Op	No	.....	.....
	C18GR3350	A	18	Rad	G	2200	2800	SL	100	2670	1.21	6 1/8 x 6 5/16	3347	6.85	146	6.61&8.81	38	55 3/4	76.26	.460	.025	Prr	AlS	Op	M	Scint	Ceco	Op	No	.....	.....

[1] Blower ratio on two-speed is 9.52:7
[2] Or 16:9
[3] With water injection
[4] Or 9.89:1

A —Aircooled
Al—Aluminum alloy
B —Battery

Ch. —Champion
D —Direct
Eclip.—Eclipse

Ed. Split—Edison Splitdorf
Eise. —Eisemann
G —Geared

Hol —Holley
Hopp —Horizontal opposed
L —Liquid Cooled

Lid—Inline inverted
M —Magneto
NI —Nickel Iron

Prr —Push rod-rocker
Rad—Radila
S —Steel

Scint—Scintilla
SL —Sea level
St —Stromberg

ms—main stage
al —aux. low
ah —aux. high

Aviation's American A

Manufacturer	Designation or Model No. — Company	Army or Navy	A.T.C. number	Type	Number of seats	Power Plant: Number and make of engine	Rated hp. each	At altitude, ft.	Fuel capacity, gal.	Normal range, mi.	Propeller diameter, in.	Dimensions: Span	Length overall	Height overall	Area (Sq.: Wing (including ailerons)	Ailerons (total)	Fin	Rudder
PERSONAL																		
Aerobat Aircraft	A			CLM	1	1 Continental	50	SL	42	1500	70	24′	17′	5′6″	185	10	7.5	6.
	B			CLM	2	1 Lycoming	75	SL	35	1000	70	26′	18′	6′ 6″	230	None	8.2	10
Aeronca Aircraft Corp.	Champion			CLM	2	1 Continental	65	SL	15	270	72	35′	21′ 6″	9′ 1″	170	15.52	5.51	6.
	Chief			CLM	2	1 Continental	65	SL	23	420	72	36′	20′ 10″	9′ 1″	175	15.52	5.51	6.
	Chum [1]			CLM	2	1 Continental	85	SL	23	540	74	28′ 8″	20′	6′ 2″	140	16.68	5.43	2.
All American Aircraft, Inc.	10 Ensign			CLM	2	1 Continental	85	SL	25	500	74	33′	22′	8′ 6″	140	15	8.5	3.
Applegate & Weyant Engrg. Co.	Dart			CLM	2	1 Continental	100	SL										
Aviation Boosters, Inc.	Skyhopper			OLM	1	1 Continental	50	SL	10	275		25′	18′	5′ 3″				
Beech Aircraft Corp.	G17S			CLB	5	1 P & W	400	5000	124	1050	99	32′	26′ 9″	8′	296.4	22.96	8.33	8.
Bellanca Aircraft Corp.	14-13 Cruisair Sr.			CLM	4	1 Franklin	150	SL	40	600	74	34′ 2″	23′	6′ 3″	140			
H. D. Boggs	Airmaster-Aircar [2]			CLM	4	1	145			500	84	35′	26′ 6″					
Call Aircraft Co.	A		758	CLM	2	1 Lycoming	100	SL	27	411	74	35′ 10″	23′ 7″	7′	181.6	21.8	8.6	8.
	A2		758	CLM	2–3	1 Lycoming	125	SL	27	354	76	35′ 10″	23′ 7″	7′	181.6	21.8	8.6	8.
Cessna Aircraft Co.	120			CLM	2	1 Continental	85	SL										
	140			CLM	2	1 Continental	85	SL	25									
Commonwealth Aircraft, Inc.	Skyranger			CLM	2	1 Continental	85	SL	30	600	72	34′	21′ 9″	6′ 7″	164.6			
	Trimmer			CAM	3	2 Continental	85	SL	40	250–500	72	35′ 6″	24′ 10″	8′ 7″	162.5	16.3	9.5	8.
Consolidated Vultee-Stinson Div.	Voyager 150		767	CLM	4	1 Franklin	150	SL	40	500		34′	23′ 6″	7′ 4″				
Culver Aircraft Corp.	Model V [3]			CLM	2	1 Continental	85	SL	35	720+		29′	20′ 6″	6′ 9½″	125.9			
Curtis Wright Industries	CW-21 Skypal			CLM	4	1 Continental	125	SL	40	500	84	40′	26′	7′ 6″	223	20	8	12
Engineering & Research Corp.	AA-2 Ercoupe [4]		718	CLM	2	1 Continental	75	SL	23	500	74	30′	20′ 9″	5′ 11″	142.6	16.8	3.3	6
Cheston L. Eshelman	FW-5			CLM	4	1 Lycoming	235	SL	50	700		30′	23′ 7″	9′ 7″	232	13	4.2	6
	EF-100 [5]			CLM	2	1 Franklin	100	SL	25	550		30′	18′ 11″	9′	122	9.7	4	4
Fairchild Engine & Airplane Corp.	PT-19A			OLM	2	1 Ranger	175	SL	45	422	86	37′	28′	7′ 6″	200	16.72	6.15	14
	F-24R-46			CLM	4	1 Ranger	175	SL	60	620	86	36′ 4″	25′ 10″	7′ 8″	193.3	21	6.1	10
	F-24W-46			CLM	4	1 Warner	165	SL	60	639	86	36′ 4″	23′ 10″	7′ 8″	193.3	21	6.1	10
	M-84 [6]																	
Globe Aircraft Corp.	GC-1A Swift			CLM	2	1 Continental	85	SL	30	750	72	29′ 4″	19′ 7″	6′ 2″	131.63	9.3	3.62	5
Grumman Aircraft Engr. Corp.	G-44 Widgeon		734	CAM	4–5	2 Ranger	200	SL	108	775	82	40′	31′ 1″	9′	245			
Max B. Harlow	PJC-4 [7]			CLM	2	1 Lycoming	220	SL	56	804	96	35′ 9″	31′ 8″	8′ 2″	185	13.02	9.04	8
	PJC-10			CLM	4	1 Lycoming	220	SL	56	804	96	35′ 9″	28′ 4″	8′ 2″	185	13.02	9.04	8
Hockaday Aircraft Corp.	CF-130 Comet			CLM	2	1 Franklin	130	SL	24	500		33′	22′ 2″		156			
Jarvis Mfg. Co.	VJ-21			CLM	2	1 Lycoming	65	SL	15	400	60	40′	24′	6′	145	16.6	8	6
Johnson Aircrafts, Inc.	185 Rocket			CLM	2	1 Lycoming	185		56	1000*		31′	21′ 7″	7′	142			
Le Mars Mfg. Co.	MI-80 Skycoupe [8]		742	CLM	2	1 Lycoming	75	SL	20	400	75	31′ 5″	22′	8′ 8″	135	13.7	25	0
Luscombe Airplane Corp.	8-A Silvaire			CLM	2	1 Continental	65	SL	14	400	76	35′	20′	5′ 10½″	140	14.8	4.9	5
	8-E Silvaire			CLM	2	1 Continental	85	2000	24	550	76	35′	20′	5′ 10½″	140	14.8	4.9	5
Midwest Aircraft Co.	XC-65 Mercury			CLM	2	1 Continental	65	SL	18	400	72	32′	20′ 2″	6′	140	14.8	8.2	5
	XC-75 Mercury			CLM	2	1 Continental	75	SL	18	400	74	32′	20′ 2″	6′	140	14.8	8.2	5
Nelson Aircraft Corp.	BB1 Bumblebee			CLM	2	1 Nelson	25	500	3	125	42	47′ 4″	19′ 8″	6′ 10″	169.3	24.2	3.89	5
Piper Aircraft Corp.	J3C Cub Special		691	CLM	2	1 Continental	65	SL	12	200	72	35′ 2½″	22′ 4½″	6′ 8″	178.5	19.2	4	6
	J5C Super Cruiser			CLM	3	1 Lycoming	104	SL	38	600	74	35′ 5½″	22′ 6″	6′ 10″	179.3	19.2	4.7	6
	PA-8 Skycycle [9]			CLM	1	1 Lycoming	55	SL	14	400		20′	16′	5′				
Puget Pacific Planes, Inc.	111A Wheelair [10]			CLM	4	1 Ly or Fr	125	SL	30	392	84	37′	26′	7′	178	13.36	24.68	No
	111A-3 Wheelair			CLM	4	1 Continental	145	SL	45	534	84	37′	26′	7′	178	13.36	24.68	No
Republic Aviation Corp.	RC-3 Seabee			CAM	4	1 Franklin	212	SL	75	550		37′ 8″	28′	9′ 4″				
Skylark Mfg. Co., Inc.	446-190L Skycraft			CLM	4	1 Ly or Fr	190	SL	50	620	72	36′	26′ 3″	7′ 4″	180		12.1	6
Spartan Aircraft Co.	12 Executive			CLM	5	1 P&W SB-3	150	SL	132	1097	102	39′	27′ 5″		245	22.80	10.11	9
Taylorcraft Aviation Corp.	BC12-D Standard		596	CLM	2	1 Continental	65	SL	18	378	72	36′	22′	6′ 6″	183.7	20	3.7	6
	BC12-D De Luxe		596	CLM	2	1 Continental	65	SL	24	504	72	36′	22′	6′ 6″	183.7	20	3.7	6
Tennessee Aircraft, Inc.	G-I-100 Skyfarer [11]			CLM	2	1 Lycoming	100	SL										C
TRANSPORT																		
Aero Design & Engr. Co.	L-3805 Aero Commander			CLM	6	2 Lycoming	200	SL	100	700	77	43′ 10″	32′ 4″	12′	242	16.06	17	11.
Beech Aircraft Corp.	D-18C			CLM	6–10	2 Continental	500	3900	286	1300	99	47′ 7″	33′11½″	9′ 2½″	349	22.6	16.3	17.
	D-18S UC-45 Traveler			CLM	6–8	2 P&W Wasp	400	5000	286	1535	99	47′ 7″	33′11½″	9′ 2½″	349	22.6	16.3	17.
Boeing Aircraft Corp.	377-2 Stratocruiser C-97			CLM	100	4 P&W R-4360	3500	SL	7055	3500	199	141′ 3″	110′ 4″	33′ 3″	1750.8	129.2	172.6	65.
	417			CLM	20	2 Ranger	700	SL		200–600		90′	55′ 4″	18′ 10″	508			
	431			CLM		2 P&W R-2800	2100	SL	1300	200–1000		96′	96′	26′ 1″	738			
Vincent J. Burnelli				CLM	40–72	4 Allison V-1710			2000	2000		115′	71′ 6″	16′ 8″	1200			
Consolidated Vultee Aircraft Corp.	CV-37			CLM	216	6 (Pusher)	5000	SL	15510	4200		230′	182′ 6″	57′ 6″	4772			
	CV-110			CLM	30–40	2 P&W R-2800	2100	SL				91′	71′	25′ 2½″	820			
	CV-240			CLM	40	2 P&W R-2800	2100	SL		500+		88′	70′					
Curtiss-Wright Corp.	CW-20E C-46 Commando			CLM	36–42	2 Wr. C-18-B2	2200				175	108′	76′ 4″	21′ 9″	1360	79.2	115.4	52.
Douglas Aircraft Co.	DC-4 C-54 Skymaster			CLM	44	4 P&W R-2000	1100		2877	4240	162	117′ 6″	93′ 5″	27′ 7″	1457	93.6	90.5	47.
	DC-6			CLM	52	4 P&W R-2800	1700		2577	2680	162	117′ 6″	100′ 7″	27′ 7″	1457	81	93.4	49
	DC-7 C-74 Globemaster			CLM	118	4 P&W R-4360	3000		11000	4000+	228	173′ 3″	123′ 4″	43′ 8″				
	DC-8			CLM	48	2 Allison V-1710	1240		1000	1560	182	110′ 2″	77′ 10″	24′ 7½″	1104	73.5	61.9	51.
Hughes Aircraft Corp.	H-4			CMF		8 P&W R-4360	3500	SL	14300	3000	206	320′	218′	80′	11430	1248	1703	620
	Feederliner			CLM	18	2 P&W Wasp	825		250			86′ 9″	65′ 10″	11′ 1″				
Lockheed Aircraft Corp.	75-77 Saturn			CLM	16	2 Continental	600	4000	492	1600	134	74′	51′ 6″	19′ 10″	502			
	49-79 Constellation R60-1			CLM	67	4 Wr. R-3350	2500	3800	4690	3000	181	123′	95′ 2″	23′ 8″	1650	99.6	154	88
	89 Constitution			CLM		4												
Glenn L. Martin Co.	Mars			CFM	125	4 Wr. R-3350	2200	SL	16500	2500		200′	120′ 3″	44′ 7″	3686			
	202			CLM	30–42	2 P&W R-2800	2100	SL	625	700	162	92′ 9″	74′ 11″	25′	860	73	275	95.
Republic Aviation Corp.	RC-2 Rainbow XF-12			CLM	46	4 P&W R-4360	3250	40000	5570	4100	194	129′ 2″	98′ 9″	29′ 11″	1640	98	161	55
MILITARY A																		
Beech Aircraft Corp.	28 XA-38			CLM	2	2 Wr. R-3350	2200	SL			72	67′	51′ 6″	7′ 8″	625.9	51.7	33	36.
Bell Aircraft Corp.	XP-83			CLM	1	2 GE I-40	4000†	SL				53′	44′ 10″	15′ 3″				
Boeing Aircraft Corp.	B-29 Superfortress			CLM	11	4 Wr. R-3350	2200	SL		3000+	199	141′ 3″	99′	27′ 9″	1750.8	129.2	172.6	65.
	XF8B-1			CLM	1	1 P&W R-4360	3250	SL			162							
Consolidated Vultee Aircraft Corp.	XP-54			CLM	1	1 Lycoming	2300	SL	223		158	53′ 10″	54′ 8½″	12′ 1″	456			
	PB4Y-2 Privateer			CLM	11	4 P&W	1350	SL	3964	2360	139	110′	74′ 7½″	29′ 1⅝″	1048			
	B-32			CLM	8	4 Wr. R-3350	2200	SL	8460	4562	200	135′	83′ 1″	27′ 3½″	1422			
	B-36			CLM	17	6 P&W R-3460	3500	SL				230′	163′	46′ 7″	4772			
Curtiss-Wright Corp.	SB2C-5 Helldiver			CLM	2	1 Wr. R-2600	1900	SL	355	1514	146	49′ 8⅝″	36′ 8″	10′ 11½″	422	26.6	26.5	19.
	SC-1 Seahawk			CFM	1	1 Wr. R-1820	1350	SL	110	655	122	41′	36′ 4½″	13′ 2″	281.6	15.5	16	14.
Douglas Aircraft Co.	XB-42 Mixmaster [12]			CLM	2	2 Allison V-1710	1630	SL		3000	180							
Fairchild Aircraft & Engine Corp.	C-82 Packet			CLM	46	2 P&W R-2800	2100	SL	2870	4300	182	106′ 6″	77′ 1″	26′ 4″	1400	112	113.2	85.
Grumman Aircraft Engr. Corp.	F7F-3 Tigercat			CLM	1–2	2 P&W R-2800	2100	SL				51′ 6″	45′ 5″					
	F8F-1 Bearcat			CLM	1	1 P&W R-2800	2100	SL				35′ 6″	28′ 6″					
Lockheed Aircraft Corp.	P-80A Shooting Star			CLM	1	1 GE I-40	4000†	SL				38′ 5″	34′					
	P2V-1 Neptune			CLM		2 Wr. R-3350	2300	SL		3500+	182	100′	75′ 6″	28′ 1″	1000	66		38
Glenn L. Martin Co.	PBM-5 Mariner			CLF	9	2 P&W R-2800	2100	SL	3488	3000		118′	80′	27′ 6″	1408	75.4	58.5	37
North American Aviation, Inc.	XP-82 Twin Mustang			CLM	2	2 Pack'd Merlin	2000+	SL	600	1965	132	51′ 3″	38′ 3″	13′ 8″	408.55	27.82	45.46	16.
Northrop Aircraft, Inc.	XB-35			CLM		4 P&W R-4360	3500					172′	51′	Long	range	flying	wing	b
Republic Aviation Corp.	P-47N Thunderbolt			CLM	1	1 P&W R-2800	2800	32500	1010	3400	156		36′ 1″	13′ 7″	322	27.97	13.8	11.
Ryan Aeronautical Co.	28 FR-1 Fireball			CLM	1	Dual [13]		SL	276	1500	120	40′	32′ 1″	13′ 7⅞″				
Vought Div., United Aircraft Corp.	F4U-4 Corsair			CLM	1	1 P&W R2800C	2100	SL		1500		41′	33′ 4″	16′ 1″				
	TBU-1 Seawolf [14]			CLM	3	1 P&W R-2800	2100	SL	517	1223	160	56′ 11″	39′ 2½″	13′ 4″	439.5			

1 Blower ratio on two-speed is 9.52:7
2 Or 16:9
3 With water injection
4 2.79:1

* —Approximate
† —Pounds thrust
A —Amphibian
Al —Aluminum alloy
B —Biplane
Box —Box spar
Cl —Closed
Con —Continental
Ex —Extrusions
F —Flying Boat
Fab —Fabric
Fl —Floats
Fr —Franklin
Fx —Fixed
Go —Goodyear
Hyd —Hydraulic
Id —Inverted
L —Landplane
Lmd —Laminated
Ly —Lycoming
M —Monoplane
Me —Metal
Mech —Mechanical
Mg —Magnesium
Mo —Monocoque
O —Open
Ol —Oleo
Pl —Plastic
Ply —Plywood
Pn —Pneumatic
P&W —Pratt & Whitney
Re —Retractable
S —Steel
SL —Sea level
Sh —Shinn
Sol —Solid
Sp —Spruce
Spr —Spring
T —Tubing
Trs —Truss
Tri —Tricycle
W —Wood
Wl —Weld
Wh —Wheel
Wr —Wright

can Aircraft Specifications

Area (Sq. Ft.)					Weights				Performance							Wings			Landing Gear						Fuselage or Hull
Ailerons (total)	Fin	Rudder	Stabilizer	Elevators (total)	Wing loading (lb. per sq. ft.)	Power loading (lb. per hp.)	Weight empty, lb.	Gross weight, lb.	High speed, mph.	At altitude, ft.	Cruising speed, mph.	At altitude, ft.	Stalling speed, mph.	Climb at sea level, ft. per min.	Service ceiling	Spars	Ribs	Covering material	Type	Tread (in.)	Wheel type and size	Brakes (type and make)	Landing gear shock unit (type and make)	Tail unit	

PERSONAL AIRCRAFT

10	7.5	6.75	15	15	4.8	12.5	500	900	100	SL	75	SL	38	700	14000	Al	Al	Al	Re	90	5.00x4	None	SprAir	Wh	Me
None	8.2	10	12.5	12.5	5.4	16.5	350	1250	125	SL	40	SL	40	800	12000	Al	Al	Al	ReTri	90½	6.00x6	GoHyd	SprAir	.....	Me
15.52	5.51	6.8	13.66	1.54	7.2	18.8	710	1220	100	SL	90	SL	38	500	10000	W	WTr	Fab	Fx	70	6.00x6	Mach	SprOl	Wh	WldStFab
15.52	5.51	6.8	13.66	1.54	7.4	19.2	740	1250	100	SL	90	SL	38	500	10000	W	WTr	Fab	Fx	70	6.00x6	Mech	SprOl	Spr	WldStFab
16.68	5.43	2.82	11.91	8.34	9.57	15.8	825	1340	120	SL	108	SL	49	650	10000	Al	Al	Fab	FxTri	85	6.00x6	Hyd	SprOl	.....	Me
15	8.5	3.5	11	6	10.2	17	900	1450	125	SL	115	SL	50	750	14000	Al	Al	Al	FxTri	110	6.00x6	GoHyd	Ol	.....	MeSemiMo
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	120	SL	42	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	8.5	.....	612	850	125	SL	110	SL	.....	750	.....	W	W	Fab	Fx	.....	6.00x6	Hyd	Hyd	Wh	WldStFab
22.96	8.33	8.71	24.48	16.56	14.3	10.6	2800	4250	208	5500	181	10000	64	1250	18000	SolSp	SpPly	Fab	Re	86	7.50x10	Hyd	SprOl	Re	WldStFab
.....	.....	.....	.....	.....	15	14	1210	2100	169	SL	153	3000	45	1130	16000	Sp	Sp	Ply	Re	.....	.....	ShHyd	Bellanca	Sh	St
.....	.....	.....	.....	.....	.....	.....	.....	.....	150*	.....	130	.....	53	.....	.....	.....	.....	.....	Tri	84	.....	.....	.....	.....	.....
21.8	8.6	8.8	15.8	14	8.53	15.5	960	1550	112	SL	101	SL	45	710	15500	LmdSp	Sp	Fab	Fx	98	8.00x4 Hayes	HydHayes	SprOl	SprWh	WldStFab
21.8	8.6	8.8	15.8	14	8.53	12.4	975	1550	120	SL	109	SL	45	1000	17500	LmdSp	Sp	Fab	Fx	98	8.00x4 Hayes	HydHayes	SprOl	SprWh	WldStFab
.....	.....	.....	.....	.....	.....	.....	.....	.....	125†	SL	100†	SL	.....	.....	.....	Me	Me	Fab	Fx	.....	.....	.....	Spr	Wh	Me
.....	.....	.....	.....	.....	.....	.....	.....	.....	125†	SL	100†	SL	.....	.....	.....	Me	Me	Fab	Fx	.....	.....	.....	Spr	Wh	Me
.....	.....	.....	.....	.....	8.81	17.06	.....	1450	114	SL	103	SL	38	650	14000	.....	.....	Fab	Fx	72	.....	Hyd	Hyd	SprWh	WldStFab
16.3	9.5	8.75	14.5	11	13.55	1292	1470	2200	135	SL	115	SL	48	850	12500	WBox	W	Ply	Re	84	7.00x6	GoHyd	Hyd	SprWh	Ply
.....	.....	.....	.....	.....	.....	14.3	1206	2150	133	SL	125	SL	.....	770	14000	Sp	Me	Fab	Fx	.....	.....	.....	.....	.....	StFab
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	W	W	Ply	ReTri	97½	6.00x6	.....	.....	.....	Ply
20	8	12	17.5	13.5	10.65	19	1300	2375	120	SL	.....	.....	50	700	.....	WBox	SpPly	Fab	Tri	108	6.00x6	GoSpot	SprOl	.....	StTMg
16.8	3.3	6	10.2	9.4	8.8	16.8	750	1260	127	SL	110	SL	48	750	14000	Al	Al	Fab	FxTri	.....	Hayes 7.00x4	Hyd	Ol	.....	MeMo
13	4.2	6	13.6	11.2	11.4	11.3	1507	2650	180	.....	165	.....	50	1200	18000	Me	Me	Fab	Re	126	.....	.....	.....	FxWh	.....
9.7	4	4.5	10	8	12.6	15.4	939	1544	135	.....	115	.....	50	900	15000	Me	Me	Fab	Fx	113	.....	.....	.....	FxWh	MeFab
16.72	6.15	14.5	26.77	13.23	12.6	14.4	1851	2518	125	SL	105	SL	52	655	12800	Sp	Sp	Ply	Fx	112	6.50x10	Hyd	SprOl	SprOl	WldStFab
21	6.1	10.2	21.9	13.5	13.3	14.6	1650	2562	133	SL	118	SL	53	650	14000	Sp	Sp	Fab	Fx	111	6.50x10	Hyd	SprOl	SprOl	WldStFab
21	6.1	10.2	21.9	13.5	.....	15.5	1613	.....	132	SL	117	SL	.....	.....	.....	Sp	Sp	Fab	Fx	111	6.50x10	Hyd	SprOl	SprOl	WldStFab
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9.3	3.62	5.53	13.3	7.12	11.93	18.47	940	1570	140	SL	125	SL	42	700	14500	Me	Me	Me	Re	117	Go 6.00x6	GoHyd	Ol	Ol	Me
.....	.....	.....	.....	.....	18.3	11.25	3050	4500	164	SL	150	SL	58	1000	15500	Me	Me	Me	Re	90	7.50x10	Hyd	.....	ReWh	Me
13.02	9.04	8.49	22.01	15.1	16.05	13.12	2155	2893	170	SL	150	SL	55	1200	15600	Me	Me	Me	Re	90	Hay 7.50x10	Hayes	Ol	Wh	MeMo
13.02	9.04	8.49	22.04	15.1	17.75	14.53	2082	3200	170	SL	150	SL	55	1200	15500	Me	Me	Me	Re	90	Go 7.50x10	Go	Ol	Wh	MeSemiMo
.....	.....	.....	.....	.....	10.25	12.8	953	1600	140	.....	130	.....	50	1150	19000	LmdW	W	Fab	Fx	.....	.....	.....	.....	Wh	WldStFabMe
16.6	8	6	13.5	8	9.6	13	850	1350	135	SL	110	SL	35	700	16000	Me	Me	Me	Monopd	.....	8.50x22	Hyd	None	.....	Me
.....	.....	.....	.....	.....	.....	.....	1550*	2450*	.....	.....	185	.....	50	2000	24500	Sp	Sp	PlyFb	ReTri	110	6.00x6	Hyd	Hyd	.....	WldStFab
13.7	25	0	16.6	8.3	11.2	18	890	1350	100	SL	92	SL	44	550	10000	Me	Me	MeFb	FxTri	72	Shinn 6.00x6	ShinnHyd	Ol	.....	AlExFab
14.8	4.9	5.65	13	8.75	8.6	18.5	720	1200	115	SL	104	SL	45	650	15000	Me	Me	Fab	Fx	76	Shinn 6.00x6	Shinn	SprOl	Wh	Me
14.8	4.9	5.65	13	8.75	10	16.5	850	1400	133	2000	115	2000	52	750	15000	Me	Me	Fab	Fx	76	Go 6.00x6	Go	SprOl	Wh	Me
14.8	8.2	5	14.6	8	8.6	18.5	704	1200	115	SL	105	SL	43	600	14000	Al	Al	AlFab	Fx	78	Go 6.00x6	GoMech	SprMidw	SprWh	WldStFab
14.8	8.2	5	14.6	8	9.15	17.1	762	1280	125	SL	112	SL	45	625	16000	Al	Al	AlFab	Fx	78	Go 6.00x6	GoMech	SprMidw	SprWh	WldStFab
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Ply
24.2	3.89	5.89	10.75	10.75	5.31	36	510	900	75	500	70	500	32	400	10000	W	W	PlyFb	ReTri	52	14 in.	.....	.....	.....	.....
19.2	4	6.5	14.7	10.6	6.8	18.8	680	1220	83	SL	73	SL	37	450	11000	WorMe	Me	Fab	Fx	71	Hayes 8.00x4	Hyd	Shcord	Wh	WldStFab
19.2	4.7	6.8	15.1	11.7	9.76	16.82	1000	1750	115	SL	103	SL	46	620	12500	WorMe	Me	Fab	Fx	74½	8.00x4	Hyd	Shcord	Wh	WldStFab
.....	.....	.....	.....	.....	.....	.....	560	850	115	SL	100	SL	46	600	.....	Me	Me	Fab	Fx	71	5.00x4	Hyd	Shcord	Wh	Pl & Me
13.36	24.68	None	30.9	17.8	12.85	18.3	1260	2290	114*	SL	.....	.....	.....	525	10847	Me	Me	Me	FxTri	126	23′ dia.	Hyd	Ol	.....	Me
13.36	24.68	None	30.9	17.8	13.82	16.95	1340	2460	130*	SL	.....	.....	.....	645	13000	Me	Me	Me	FxTri	126	23′ dia.	Hyd	Ol	.....	Me
.....	.....	.....	.....	.....	15.3	14.2	1980	3000	120	SL	102	SL	50	.....	12000	Me	Me	Me	Re	96	.....	.....	.....	.....	Me
.....	12.1	6.6	15.5	12.5	15.56	14.74	1510	2800	162	SL	142	SL	49	720	13750	Al	Al	Al	ReTri	108	7.00x8	Hyd	SprOl	.....	Me
22.80	10.11	9.89	22.30	16.49	19.18	.....	2846	4694	218	7000	203	8000	38	1350	24090	Me	Me	Me	ReTri	94	7.50x10	Hyd	Ol	.....	Me
20	3.7	6.3	13	10.66	6.54	18.4	730	1200	105	.....	95	.....	38	600	15000	W	Me	Fab	Fx	72	6.00x6	Mech	Sh cord	Wh	WldStFab
20	3.7	6.3	13	10.66	6.54	18.4	730	1200	105	.....	95	.....	38	600	15000	W	Me	Fab	Fx	72	6.00x6	Mech	Sh cord	Wh	WldStFab
.....	.....	O	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Me	Me	Me	FxTri	.....	.....	.....	.....	.....	Me

TRANSPORT AIRCRAFT

16.06	17	11.1	35	15.2	17.3	10.3	2500	4200	185	SL	180	10000	56	1400	22000	Me	Me	Me	ReTri	148	7.50x10	.....	PneuHyd	.....	Me
22.6	16.3	17.28	38.18	27.22	25.8	9	6100	9000	231	5000	219	10000	77	1850	24700	Me	Me	Me	Re	155	11.00x12	Hyd	AirOl	ReWh	Me
22.6	16.3	17.28	38.18	27.22	25.1	10.9	6000	8750	226	5000	198	10000	65	1240	20500	Me	Me	Me	Re	155	11.00x12	Hyd	AirOl	ReWh	Me
129.2	172.6	65.2	218	115	.....	.....	74110	130000	400	.....	340	23500	....	2000	30000	Me	Me	Me	ReTri	341.6	Dual 56″	Hyd	Ol	.....	Me
.....	.....	.....	.....	.....	.....	.....	.....	18400	243	.....	200	.....	.....	.....	24800	.....	.....	.....	ReTri	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	23751	36000	287	.....	252	.....	.....	.....	30000	.....	.....	.....	ReTri	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	25	.....	31000	57500	375*	10000	300	10000	65	1200	25000	Me	Me	Me	Re	330	.....	.....	.....	Re	Me
.....	.....	.....	.....	.....	67.2	10.6	64100	320000	370	20000	340	25000	85	....	30000	Me	Me	Me	ReTri	552	Go	Go	.....	.....	Me
.....	.....	.....	.....	.....	39.3	7.7	20680	32300	322	.....	275	.....	79	....	29100	Me	Me	Me	ReTri	298	Hayes	Hayes	Bendix	.....	Me
.....	.....	.....	.....	.....	.....	.....	.....	34000*	350*	.....	300*	.....	.....	....	29000*	Me	Me	Me	ReTri	.....	.....	.....	.....	.....	Me
79.2	115.4	52.8	158.5	98.4	33.09	14.06	32100	48000	265	.....	242	10000	71	.....	.....	Me	Me	Me	Re	311	55x19	Hyd	AirOl	Re	Wh MeSemiMo
93.6	90.5	47.3	206.4	86.1	50.1	12.7	40409	73000	270	11000	234	22900	80	880	24000	Me	Me	Me	ReTri	296	.....	PnOl	.....	.....	MeSemiMo
81	93.4	49	210.9	108.9	56	9.7	48151	81500	342	20000	300	23800	80	1265	27400	Me	Me	Me	ReTri	296	.....	.....	PnOl	.....	MeSemiMo
.....	.....	.....	.....	.....	.....	.....	85890	162000	300+	.....	275	.....	.....	.....	.....	Me	Me	Me	ReTri	410	65′ Dual	Hyd	Ol	.....	Me
73.5	61.9	51.2	135.4	106.1	35.9	12.3	23915	39500	292	10000	270	10000	78.5	1150	30000	Me	Me	Me	ReTri	163	.....	.....	PnOl	.....	MeSemiMo
1248	1703	620	1083	1101	35	20	.....	400000	218	SL	175	2500	79	675	17000	W	W	Ply	.....	.....	.....	.....	.....	.....	PlySemiMo
.....	.....	.....	.....	.....	.....	.....	11000	18500	228	5000	186	.....	57.5	1290	28500	.....	.....	ReTri	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	37.9	11.7	9634	14000	248	8000	200	6000	72	1460	26000	Me	Me	Me	ReTri	220	27′ Smooth	Hyd	.....	.....	Me
99.6	154	88	347.3	106.8	60.6	10	55000	100000	350+	18000	310	20000	80	.....	.....	Me	Me	Me	ReTri	336	Dual 17x20	Hyd	PnOl	.....	Me
.....	.....	.....	.....	.....	.....	.....	Long	range	trans	port	.....	.....	.....	.....	.....	Me	Me	Me	ReTri	.....	.....	.....	.....	.....	Me
.....	.....	.....	.....	.....	.....	.....	78000	145000	224	.....	140	.....	85	633	16430	Me	Me	Me	.....	.....	.....	.....	.....	.....	Me
73	275	95.5	115	76	11.9	8.5	22023	34300	306	8500	270	10000	80	1660	30000	Me	Me	Me	ReTri	300	Dual 36′	Hyd	.....	.....	Me
98	161	55	285.9	105.7	69.1	8.71	68024	114200	450	40000	400+	40000	98	1680	41000	Me	Me	Me	ReTri	291	25.00x70	Go	AirOl	.....	Me

MILITARY AIRCRAFT

.....	51.7	33	36.8	115	50.9	.....	.....	22330	36332	.....	.....	.....	.....	.....	.....	.....	Me	Me	Me	Re	.....	.....	.....	.....	Re Wh	Me
.....	.....	.....	.....	.....	.....	.....	.....	15500	27000+	500+	.....	.....	.....	.....	.....	.....	Me	Me	Me	ReTri	.....	.....	.....	.....	.....	Me
8	129.2	172.6	65.2	218	115	70+	13.6	70000	130000	350+	.....	250	25000	....	5000	35000	Me	Me	Me	ReTri	341.6	Dual 56′	Hyd	Ol	.....	MeSemiMo
.....	.....	.....	.....	.....	.....	.....	.....	.....	450+	.....	.....	.....	.....	.....	.....	.....	Me	Me	Me	Re	.....	.....	.....	.....	Re	Me
.....	.....	.....	.....	.....	.....	40.2	7.9	15338	18359	400	28500	.....	.....	110	.....	34200	Me	Me	Me	ReTri	241.5	.....	.....	.....	.....	Me
.....	.....	.....	.....	.....	.....	64	12.4	37765	67144	245	13750	215	15000	93	....	21200	Me	Me	Me	ReTri	307.5	Hayes	Hayes	Bendix	.....	Me
.....	.....	.....	.....	.....	.....	84.3	13.6	59362	119895	358	25000	250	25000	99	....	32600	Me	Me	Me	ReTri	336	Hayes	Hayes	Bendix	.....	Me
.....	.....	.....	.....	.....	.....	.....	.....	.....	130000	.....	.....	.....	.....	.....	.....	.....	Me	Me	Me	ReTri	.....	Go 110″ dia.	Go	.....	.....	Me
26.6	26.5	19.2	79.6	27.8	36.8	11.5	10738	15536	294	16200	245	10000	82	1800	23950	Me	Me	Me	Re	192	32x8.8	Hyd	Ol	Re	Wh MeSemiMo
15.5	16	14.1	34.6	17.8	28	6.6	6561	7881	301	24000	223	10000	65.7	2080	34000	Me	Me	Me	Fl	.....	.....	.....	.....	.....	MeSemiMo
.....	.....	.....	.....	.....	.....	.....	.....	35702	400+	.....	.....	.....	.....	.....	.....	.....	Me	Me	Me	ReTri	.....	.....	.....	.....	.....	Me
.....	112	113.2	85.6	219	91	35.7	11.9	27140	50000	244	17500	200	10000	84	900	25000	Me	Me	Me	ReTri	336	56′	HayesHy	AirOl	.....	Me
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	425+	.....	.....	.....	.....	4300	.....	Me	Me	Me	ReTri	.....	.....	.....	.....	.....	Me
.....	.....	.....	.....	.....	.....	.....	.....	9300	.....	420+	.....	.....	.....	.....	5000	.....	Me	Me	Me	Re	.....	.....	.....	.....	.....	Me
.....	.....	.....	.....	.....	.....	.....	8000	14000	.....	550+	.....	.....	.....	.....	.....	45000+	Me	Me	Me	ReTri	.....	.....	.....	.....	.....	Me
.....	.....	.....	.....	.....	.....	.....	.....	58000	.....	.....	.....	.....	.....	.....	.....	.....	Me	Me	Me	ReTri	.....	.....	.....	.....	.....	Me
.....	66	.....	38.4	.....	39.3	58	16.1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Me
.....	75.4	58.5	37.7	145.3	96.02	.....	.....	32328	56000	200+	.....	147	.....	82	588	20200	Me	Me	Me	.....	.....	.....	.....	.....	.....	.....
5	27.82	45.46	16.08	68.21	21 63	49	6.17	14350	20000	480+	25000	.....	.....	102	5280	45000	Me	Me	Me	Re	200	Go 32″	Hyd	Menasco	Re	Wh Me
.....	flying	wing	bom	ber	.....	.....	.....	.....	180000*	.....	.....	.....	.....	.....	.....	.....	Me	Me	Me	ReTri	.....	.....	.....	.....	.....	.....
.....	27.97	13.8	11.9	33	22	43.3	5	11109	13954	467	32500	300+	.....	98	3700	40000	Me	Me	Me	Re	222	34x9.9	Go	AirOl	Re	Wh Me
.....	.....	.....	.....	.....	.....	.....	.....	7736	9862	400+	207	.....	.....	.....	5000	.....	Me	Me	Me	ReTri	166½	Go 26x6.6	Go Disk	PnOl	.....	Me
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	450+	.....	.....	.....	.....	.....	35000	Me	Me	Me	.....	.....	.....	.....	.....	Re Wh	Me
.....	.....	.....	.....	.....	.....	39.2	8.2	10993	17237	300+	19800	192	18500	82	...	29500	Me	Me	Me	Re	122.8	Go	Go	.....	Re Wh	Me

Weld
Wheel
Wright

[1] Two control, licensedunder Weick patents.
[2] Body detachable for use on auto chassis as well as air-frame.
[3] Uses Mooney " Simpli-fly " controls.
[4] Two control.
[5] To be produced by Wolfe & Mann Mfg. Co., Baltimore, Md.
[6] Experimental craft only; not going into production.
[7] Experimental craft for research on Model 10, which goes into production.
[8] Two-control; General Skyfarer design.
[9] Experimental craft for research on $800–$1,000 plane.
[10] Two control.
[11] Two control.
[12] Contra rotating propellers mounted aft of empennage.
[13] Wright R-1820 at 1,350 hp., and GE I-16 turbojet at 1,670 lb. static sea level thrust.
[14] Built by Consolidated Vultee Aircraft Corp.

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Manufacturer	General: Designation or Model No.	Type	Number of seats	Power Plant: Make of engine	Rated hp. each	At altitude, ft.	Fuel capacity, gal.	Normal range, mi.	Dimensions: Span	Length overall	Height overall	Wing (includ-
BRITISH & CANA												
Airspeed, Ltd.	A.S. 57 Ambassador	CLM	27–43	2 Bristol Centaurus	2,500	....	.....	1,000	115′	80′ 3″	18′ 9″	1,200
A. V. Roe & Co., Ltd.	Lancastrian [1]	CLM	15	4 R-R Merlin 24	1,620	....	.....	4,150	102′	76′ 10″	19′ 6″	1,29
	Tudor 1	CLM	17	4 R-R Merlin 100	1,610	....	.....	4,890	120′	79′ 6″	22′	1,42
	Tudor 2	CLM	65	4 R-R Merlin 90	1,850	....	.....	4,000	120′	105′ 7″	24′	1,42
	Lincoln 2	CLM	.....	4 R-R Merlin 68	1,750	....	3,520	4,450	120′	78′ 8½″	17′ 3½″	1,42
Blackburn Aircraft, Ltd.	Clydesman [2]	CFM	72–160	6 Radial	.....	....	.....	2,500+	202′	148′	.....	5,00
	Firebrand T.F. 4	CLM	1	1 Bristol Centaurus	2,500	SL	.....	.....	51′ 3½″	39′ 1″	15′ 2″	38
Bristol Aeroplane Co., Ltd.	167 Brabazon 1 [3]	CLM	80–224	8 Bristol Centaurus	2,500	....	.....	.....	230′	177′	52′	....
	Wayfarer	CLM	36–42	2 Bristol Hercules 130	1,675	....	.....	1,000	98′	68′ 4″	21′ 8″	1,40
	Buckmaster	CLM	2	2 Bristol Centaurus 7	2,500	SL	.....	.....	71′ 10″	46′ 5″	17′ 5″	....
	Brigand T.F. 1	CLM	.....	2 Bristol Centaurus 57	.....	....	1,060	1,980	72′ 4″	46′ 5″	16′ 4″	71
	Buckingham B 1	CLM	3	2 Bristol Centaurus 7	.....	....	1,066	2,150	71′ 10″	46′ 10″	17′ 7″	70
Vincent Burnelli	CBY-3 [10]	CLM	26	2 P & W Twin Wasp	1,200	....	750	1,200	86′	57′ 7″	13′ 4″	62
de Havilland Aircraft Co., Ltd.	DH Dove	CLM	9–12	2 DH Gipsy Queen 71	330	SL	.....	1,000	57′	39′ 4″	13′	33
	DH Hornet	CLM	1	2 R-R Merlin	2,070	....	.....	2,500	45′	34′ 6″	.....	36
	DH Vampire 2	CLM	1	1 DH Goblin 2 turbojet	3,000†	SL	554	1,050	44′	30′ 9″	8′ 10″	25
Fairey Aviation Co., Ltd.	Firefly 4	CLM	2	1 R-R Griffon 74	.....	....	.....	.....	.....	.....	.....	....
	Spearfish	CLM	2	1 Bristol Centaurus 57	2,585	SL	900	1,050	60′	45′ 4″	16′ 6″	53
Fleet Aircraft, Ltd.	80 Canuck	CLM	2	1 Continental	75	SL	.....	400	34′	22′ 4″	6′ 6″	17
Gloster Aircraft Co., Ltd.	Meteor F. 4 [4]	CLM	1	2 R-R Derwent 5 turbojets	4,000†	SL	.....	.....	43′	41′	13′	37
Handley Page, Ltd.	Hermes	CLM	25–55	4 Bristol Hercules 100	1,650	....	.....	3,030	113′	81′ 6″	22′ 6″	1,40
	Manx Flying Wing [5]	CLM	2	2 DH Gipsy Major	140	....	.....	.....	40′	18′	.....	24
Hawker Aircraft, Ltd.	Sea Fury 10 [6]	CLM	1	1 Bristol Centaurus 18	2,440	....	.....	1,160	38′ 5″	34′ 6″	14′ 7½″	28
Martin-Baker Aircraft, Ltd.	M.B. 2	CLM	1	1 R-R Griffon	.....	....	.....	.....	35′	37′ 9½″	15′	....
Noorduyn, Ltd.	Norseman 5	CLM	8–10	1 P & W R-1340 Wasp	600	SL	125	600	51′ 6″	32′	10′ 3″	32
Percival	Merganser [7]	CLM	6–8	2 DH Gipsy Queen 51	296	....	.....	830	47′ 9″	38′ 9″	14′ 6″	31
Phillips & Powis, Ltd.	M. 28-4 Mercury	CLM	4	1 DH Gipsy Major 2A	150	....	.....	.....	30′ 6″	24′	8′ 4″	16
	M. 48	CLM	2–4	1 DH Cirrus Major	150	....	.....	.....	36′ 2″	24′	7′ 6″	19
	M. 56	CLM	26	2 R-R Merlin	1,620	SL	.....	1,600	80′	66′	.....	80
	M. 57 Aerovan	CLM	7–11	2 DH Cirrus Major 2A	150	....	50	450	50′	36′	13′ 6″	39
	M. 60 Marathon [8]	CLM	16–22	4 DH Gipsy Queen	330	....	.....	750	65′	51′ 6″	13′ 3″	....
Short Bros., Ltd.	Shetland [9]	CFM	88	4 Br. Centaurus 7	2,500	SL	6,112	4,650	150′	110′	12′ 6″	2,63
Supermarine Vickers Armstrong, Ltd.	V.C. 1 Viking	CLM	23–30	2 Bristol Hercules 130	1,675	SL	750	1,000	89′ 3″	62′ 10″	19′ 7″	88
	Spiteful XIV	CLM	1	1 R-R Griffon 85	2,050	....	.....	530	35′	32′ 4″	10′	21
	Windsor B. 1 [11]	CLM	.....	4 R-R Merlin 85	.....	....	.....	.....	117′ 4″	77′ 6″	.....	....
GERMAN												
Arado Flugzeugwerke GmbH	Ar 234B	CLM	1	2 Junkers Jumo 004 turbojet	1,970†	SL	836	.....	47′ 4½″	41′ 7½″	13′ 8½″	29
Bachem	BP 20 Natter	CLM	1	1 Walter HWK-509 rocket	2,200†	SL	.....	.....	13′	20′ 6″	.....	....
Blohm & Voss	Bv 222 Viking	CFM	.....	6 Bramo 323-P	986	SL	5,390	4,740	151′ 9″	120′ 6″	18′ 6″	2,74
	Bv 238	CFM	.....	6 DB 603	1,725	SL	10,926	4,150	198′ 6″	143′	21″ [12]	3,94
Dornier Werke GmbH	Do 335	CLM	1–2	2 DB 603E Tandem	1,700	....	4	1,280	45′ 4″	45′ 6″	16′ 5″	41
Focke Wulf	Ta 152H	CLM	1	1 Junkers Jumo 213E	.....	....	250	.....	48′ 6″	.....	.....	....
	Ta 154A	CLM	1–2	2 Junkers Jumo 211 N or R	.....	....	330	1,195	52′ 6″	41′ 3″	12′ ½″	34
	Ta 400	CLM	.....	6	.....	....	5,940	3,000+	137′ 9″	92′ 5″	.....	....
Gothaer Waggonfabrik	P-60B Flying Wing	CLM	2	2 Heinkel Hirth O11	2,860†	SL	.....	.....	44′ 3½″	33′ 9½″	11′ 5½″	58
	P-60C Flying Wing	CLM	3	2 Heinkel Hirth O11	2,860†	SL	.....	.....	44′ 3½″	35′ 9½″	.....	....
E. Heinkel Flugzeugwerke GmbH	He 162 Volksjaeger	CLM	1	1 BMW 003	1,760†	SL	242	.....	23′ 7½″	34′	.....	12
	He 177 A-5	CLM	6	2 DB 610	.....	....	2,786	.....	103′ 1″	72′	21′ 11″	1,07
	He 219	CLM	2	2 DB 605	.....	....	577	1,335	60′ 8″	51′	14′ 5″	47
	He 274 [13]	CLM	4	4 DB 603	.....	....	1,805	.....	145′	73′	.....	1,61
Junkers Flugzeug und Mb. AG	Ju 287 [14]	CLM	3	6 BMW 003A-1	1,760†	SL	.....	1,175	66′	60′	.....	62
	Ju 290	CLM	48	4 BMW 801 L-2	1,650	....	1,580	2,490	138′	92′ 6″	21′ 5″	2,21
	Ju 390	CLM	.....	6 BMW 801E	.....	....	.....	4,040	165′	.....	.....	2,72
Messerschmitt AG	Me 262	CLM	1	2 Junkers Jumo 004	1,970†	SL	699	.....	40′ 11½″	34′ 9″	12′ 4″	27
	Me 163C [15]	CLM	1	1 Walter HWK-509C rocket	3,740†	SL	400	12 min.	32′ 2″	23′ 1″	.....	19
JAPANESE												
Fuji Kokuki KK	Baka 11 [16]	CLM	1	3 Type 4 rockets	.....	....	.....	55	16′ 5″	20′ 1″	3′ 9″	6
Mitsubishi	Dinah 3	CLM	2	2 Mitsu. Ha 112	1,580	SL	499	1,495	48′ 4″	36′ 3″	.....	35
Nakajima	Frances 12	CLM	3	2 Mitsu. Kasei 25	1,885	SL	1,274	2,465	65′ 6″	49′ 2″	17′ 4″	59
	Frank 1	CLM	1	1 Nakajima Ha 45	1,970	SL	359	1,560	37′ 1″	32′ 3″	11′ 2″	26
Kawanishi	George 11	CLM	1	1 Nakajima Homare 21	1,970	....	.....	580	39′ 4″	29′ 3″	13′ 3″	25
Yokosuka	Glenn 11 [17]	CFM	2	1 Amakaze	.....	SL	898	500	35′ 11″	28′	12′	....
Aichi	Grace 11	CLM	2	1 Nakajima Homare 21	1,970	SL	407	645	47′ 3″	37′ 7″	14′ 7″	37
Nakajima	Helen 2	CLM	7	2 Nakajima	1,500	SL	924	1,950	66′ 7″	54′	.....	68
Mitsubishi	Jack 21	CLM	1	1 Mitsu. Kasei 23	1,870	SL	225	405	35′ 3″	31′ 9½″	13′	21
Nakajima	Jill 12	CLM	3	1 Mitsu. Kasei 25	1,825	SL	450	1,565	49′	36′	.....	39
Aichi	Judy 33	CLM	2	1 Mitsu. Kinsei 62	1,850	SL	.....	.....	37′ 9½″	35′ 8″	.....	....
Mitsubishi	Liz 11	CLM	.....	4 Nakajima Mamoru 12	1,850	SL	3,500	2,540	138′ 3″	101′ 9″	.....	2,23
Mitsubishi	Luke 11	CLM	1	1 Ha 43	1,970	SL	.....	575	.....	.....	.....	....
Nakajima	Myrt 11	CLM	2-3	1 Nakajima Homare 21	1,970	SL	550	2,050	41′ 1″	35′ 6″	14′ 5½″	27
Kawanishi	Norm 11	CFLM	2	1 Mitsu. Kasei 24	1,825	SL	.....	2,465	45′ 8″	37′ 6″	16′ 3″	....
Mitsubishi	Peggy 1	CLM	7	2 Mitsu. Ha 42	1,970	SL	1,025	1,840	75′ 10″	61′ 4″	18′ 4″	70
Kawanishi	Rex 11	CFLM	1	1 Mitsu. Kasei 24	1,825	SL	216	1,170	39′ 4″	33′ 4″	14′	25
Mitsubishi	Sam 11	CLM	1	1 Nakajima Homare 41	1,970	SL	397	1,440	36′ 1″	29′ 5″	.....	....
Mitsubishi	Shinden J7W1 [18]	CLM	1	1 Mitsubishi	2,100	SL	.....	.....	36′ 5″	31′ 8″	11′ 8″	....
FRENCH												
Breguet	510	CLM	36	2 Gnome Rhone	1,600	....	.....	.....	.....	.....	.....	....
SNCASO	SO 30R	CLM	.....	2 Gnome Rhone	1,600	....	.....	.....	82′ 3½″	56′ 8½″	.....	....
	SO 30N	CLM	27	2 Gnome Rhone GR 14N	1,260	....	.....	2,240	.....	.....	.....	....
	SO 90	CLM	10	2 Bearn	350	....	.....	.....	.....	.....	.....	....
Bloch	161	CLM	20–33	4 Gnome Rhone	1,050	....	.....	.....	96′ 5″	.....	.....	....
SNCASO	110	.....	.....	.....	.....	....	.....	1,500*	98′ 5″	78′ 9″	.....	....
	NC 420	CFM	.....	2 In line	.....	....	.....	.....	43′ 10″	36′	.....	....
	SO 6000	CLM	.....	1 Rateu turbojet	.....	....	.....	.....	35′ 7″	.....	.....	....
Max Holste	MH 52	.....	2	1 Renault Poi	140	....	.....	.....	31′ 9″	.....	.....	....

[1] Transport version of Lancaster bomber.
[2] Projected pressurized.
[3] Prototype scheduled to fly in spring of 1947.
[4] Set world's speed record of 606 mph.
[5] Flying laboratory for research for larger aircraft.
[6] Carrier version of Hawker Fury.
[7] Prototype scheduled for test flight in June, 1946.
[8] Prototype scheduled for test flight early in 1946.
[9] Originally designed for military purposes; two built
[10] Prototype built by Canadian Car & Foundry Co.
[11] Main landing gear consists of four wheels, each retracting into engine nacelle.

oreign Aircraft Specifications

Dimensions			Weights					Performance							Wings			Landing Gear						Fuselage or Hull
Span	Length overall	Height overall	Wing (including ailerons)	Wing loading (lb. per sq. ft.)	Power loading (lb. per hp.)	Weight empty	Gross weight, lb.	High speed, mph.	At altitude, ft.	Cruising speed, mph.	At altitude, ft.	Stalling speed, mph.	Climb at sea level, ft. per min.	Service ceiling	Spars	Ribs	Covering material	Type	Tread (in.)	Wheel type and size	Brakes (Type and make)	Landing gear shock unit	Tail unit	

BRITISH & CANADIAN AIRCRAFT

5′	80′ 3″	18′ 9″	1,200	37.8	8.7	.....	45,000	.....	.....	.....	.....	.....	1,580	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2′	76′ 10″	19′ 6″	1,297	50.10	10.4	.....	68,000	310	.....	200	.....	.....	750	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1′	79′ 6″	22′	1,421	53.5	9.27	.....	77,000	346	.....	230	.....	.....	970	.....	Me	Me	Me	.....	.....	.....	.....	.....	Wh	Me
1′	105′ 7″	24′	1,421	53.5	9.5	.....	76,000	310	.....	230	.....	.....	950	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1′	78′ 8½″	17′ 3½″	1,421	52.75	.....	.....	75,000+	314	12,000	200	.....	.....	.....	35,000	Me	Me	Me	Re	.....	.....	.....	.....	Fx Wh	Me
2′	148′	.....	5,000	.....	.....	.....	310,000	307	SL	.....	.....	.....	940	.....	Me	Me	Me	.....	.....	.....	.....	.....	.....	Me
1′ 3½″	*39′ 1″	15′ 2″	381.5	.....	.....	.....	15,671	320	SL	256	10,000	75	2,200	.....	Me	Me	Me	Re	131½″	32x10	Pneu	Pn Ol	Re Wh	Me
0′	177′	52′	.....	.....	.....	.....	250,000	.....	.....	250	.....	.....	.....	.....	Me	Me	Me	Re Tri	.....	.....	.....	.....	.....	Me
8′	68′ 4″	21′ 8″	1,405	24.9	10.5	.....	35,000	240	.....	180	.....	.....	1,420	.....	Me	Me	Me	Fx	.....	.....	.....	.....	Fx Wh	Me
1′ 10″	46′ 5″	17′ 5″	.....	.....	.....	.....	33,700	352	12,000	325	18,000	.....	2,245	30,000	.....	.....	.....	.....	240	.....	.....	.....	.....	.....
2′ 4″	46′ 5″	16′ 4″	718	.....	.....	27,500	38,200	323	SL	292	10,700	.....	1,500	26,000	Me	Me	Me	Re	.....	.....	.....	Pn Ol	Re Wh	Me
1′ 10″	46′ 10″	17′ 7″	708	.....	.....	.....	37,000	330	12,000	285	8,500	.....	1,700	25,000	Me	Me	Me	Re	.....	.....	.....	Pn Ol	Re Wh	Me
5′	57′ 7″	13′ 4″	629	.....	11.27	.....	27,000	215	10,000	173	10,000	60	1,050	.....	Me	Me	Me	Re Dual	188	.....	.....	.....	Re Dual Wh	Me
7′	39′ 4″	13′	335	23.9	12.1	.....	8,000	218	7,200	160	5,000	.....	850	21,500	Me	Me	Me	Re Tri	165	.....	Pn	Rubber	.....	Me Mo
5′	34′ 6″	.....	361	.....	.....	.....	15,000	470+	.....	.....	.....	.....	4,500	35,000	Wd Me	.....	Ply Me	Re	.....	.....	.....	.....	.....	Ply
4′	30′ 9″	8′ 10″	258	34	.....	6,372	10,298	540	20,000	.....	.....	.....	4,200	.....	Me	Me	Me	Re Tri	135	.....	.....	Ol	.....	Me
0′	45′ 4″	16′ 6″	530	.....	.....	.....	24,000	292	14,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4′	22′ 4″	6′ 6″	173.5	8.25	19	858	1,425	108	.....	100	.....	45	500	12,000	.....	.....	Fab	Fx Wh	73½	.....	Hyd	.....	St Wh	Wld St Fab
3′	41′	13′	374	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Me	Me	Me	Re Tri	.....	.....	.....	.....	.....	Me
3′	81′ 6″	22′ 6″	1,408	50	10.6	.....	75,000	340	.....	194	.....	.....	1,010	.....	Me	Me	Me	Re	.....	.....	.....	.....	Re Wh	Me
0′	18′	.....	246	.....	.....	.....	.....	.....	.....	150	.....	.....	.....	15,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
8′ 5″	34′ 6″	14′ 7½″	280	.....	.....	.....	.....	435	24,500	.....	.....	.....	.....	.....	Me	Me	Me	Re	.....	.....	.....	.....	Re Wh	Me
5′	37′ 9½″	15′	.....	.....	.....	.....	.....	465*	.....	.....	.....	.....	.....	.....	.....	.....	.....	Re	.....	.....	.....	.....	Re Wh	Wld St Fab
1′ 6″	32′	10′ 3″	325	22.8	12.3	3,816	6,450	170	5,000	141	5,000	68	.....	17,000	Sp	Sp	Fab	Fx	.....	30″	.....	Ol	Fx Wh	Wld St Fab
7′ 9″	38′ 9″	14′ 6″	319	20.55	11.1	.....	6,552	194	.....	170	.....	.....	1,360	.....	Me	Me	.....	.....	.....	.....	.....	.....	.....	Me
0′ 6″	24′	8′ 4″	160	.....	.....	1,540	2,497	.....	.....	.....	.....	.....	.....	.....	Wd	Wd	Ply	Re	.....	.....	.....	.....	Fx Wh	Ply
6′ 2″	24′	7′ 6″	191	.....	.....	1,500	2,400	.....	.....	115	.....	25	.....	.....	Wd	Wd	Ply	.....	.....	.....	.....	.....	Fx Wh	Ply
0′	66′	.....	800	32	7.9	13,430	25,600	.....	.....	226	10,000	.....	1,650	.....	Me	Me	Me	Re Tri	.....	.....	.....	.....	.....	Me
0′	36′	13′ 6″	390	15	19.6	3,000	5,900	127	.....	112	.....	41	415	.....	Wd	Wd	Wd	Fx Tri	.....	.....	.....	.....	.....	Wd
5′	51′ 6″	13′ 3″	.....	.....	11.74	.....	15,000	.....	.....	175	.....	.....	1,300	.....	Me	Me	Me	.....	.....	.....	.....	.....	Wh	Me
0′	110′	12′ 6″	2,636	49.3	13	75,855	130,000	267	.....	180	.....	.....	660	.....	Me	Me	Me	.....	.....	.....	.....	.....	.....	Me
9′ 3″	62′ 10″	19′ 7″	882	38.5	10.15	21,625	34,000	.....	.....	210	10,000	83	1,400	.....	Me	Me	Me	Re	274	.....	.....	Ol	Re Wh	Me
5′	32′ 4″	10′	210	.....	.....	4,980	9,300	465	26,000	.....	.....	.....	2,500	41,500	Me	Me	Me	Re	.....	.....	.....	.....	Re Wh	Me
7′ 4″	77′ 6″	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Fab	.....	600	.....	.....	.....	.....	Me Fab

GERMAN AIRCRAFT

7′ 4½″	41′ 7½″	13′ 8½″	298	.....	.....	.....	22,000	470	19,700	.....	.....	.....	.....	37,700	Me	Me	Me	Re Tri	78	.....	.....	.....	.....	Me Semi Mo
3′	20′ 6″	.....	.....	108.4	.....	.....	3,762	625	18,500	.....	.....	.....	37,000	.....	Wd	Wd	Wd	None	.....	.....	.....	.....	.....	Wd
1′ 9″	120′ 6″	18′ 6″	2,744	38.5	.....	.....	105,600	230	6,200	152	.....	75	436	.....	Me	Me	Me	.....	.....	.....	.....	.....	.....	Me
8′ 6″	143′	21″ [12]	3,940	51	.....	.....	198,000	238	7,800	188	.....	.....	297	.....	Me	Me	Me	.....	.....	.....	.....	.....	.....	Me
5′ 4″	45′ 6″	16′ 5″	414	.....	.....	.....	21,160	477	21,000	295	19,700	109	.....	37,400	Me	Me	Me	Re Tri	.....	.....	.....	.....	.....	Me Mo
8′ 6″	.....	.....	.....	.....	.....	.....	.....	472	41,000	.....	.....	.....	.....	.....	Me	Me	Me	Re	.....	.....	.....	Hyd	.....	Me
52′ 6″	41′ 3″	12′ ½″	349	.....	.....	.....	18,600	382	19,000	.....	.....	.....	.....	31,200	Wd	.....	.....	Re Tri	.....	.....	.....	.....	.....	Wd
37′ 9″	92′ 5″	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4′ 3½″	33′ 9½″	11′ 5¾″	587.7	.....	.....	.....	22,046	625	3,760	.....	.....	95	.....	.....	.....	.....	.....	Re Tri	126	.....	.....	.....	.....	.....
4′ 3½″	35′ 9½″	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Re Tri	126	.....	.....	.....	.....	.....
23′ 7½″	34′	.....	120	.....	.....	.....	5,940	522	19,700	.....	.....	102	4,230	39,400	.....	.....	Wd	Re Tri	.....	.....	.....	.....	.....	Me Semi Mo
33′ 1″	72′	21′ 11″	1,076	63.7	.....	.....	68,500	290	18,000	.....	.....	.....	.....	26,500	Me	Me	Me	Re	.....	.....	.....	.....	.....	Me Semi Mo
30′ 8″	51′	14′ 5″	478	.....	.....	.....	29,900	385	21,000	.....	.....	.....	.....	30,000	Me	Me	Me	Re Tri	.....	.....	.....	.....	.....	Me
5′	73′	.....	1,616	.....	.....	.....	77,000	310	39,400	.....	.....	.....	.....	.....	Me	Me	Me	Re	.....	.....	.....	.....	Re Wh	Me
6′	60′	.....	628	.....	.....	.....	47,500	537	16,400	.....	.....	.....	.....	.....	Me	Me	Me	Re Dual	.....	.....	.....	.....	.....	Me
8′	92′ 6″	21′ 5″	2,210	.....	.....	52,000	100,000	280	18,000	.....	.....	.....	650	19,700	Me	Me	Me	Re	176	.....	.....	.....	Re Wh	Me
5′	.....	.....	2,728	.....	.....	.....	148,300	280	18,700	.....	.....	.....	788	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
11½″	34′ 9″	12′ 4″	270	44.5	.....	8,514	15,620	658	.....	.....	.....	.....	.....	39,000	Me	Me	Me	Re Tri	.....	8.40x3	Hyd	Ol	.....	Me
2″	23′ 1″	.....	197	.....	.....	.....	11,280	590	13,100+	.....	.....	.....	15,000+	52,500	Wd	Wd	Ply Fab	Re Skid	.....	.....	.....	.....	.....	Me

JAPANESE AIRCRAFT

16′ 5″	20′ 1″	3′ 9″	64.7	.....	.....	.....	4,536	540	.....	.....	.....	.....	.....	.....	Wd	Wd	Wd	None	.....	.....	.....	.....	.....	Me Mo
48′ 4″	36′ 3″	.....	352	.....	.....	8,215	12,405	390	22,000	219	1,500+	.....	3,170	37,800	Me	Me	Me	Re	157	.....	.....	.....	.....	Me
55′ 6″	49′ 2″	17′ 4″	592	.....	.....	17,950	23,940	354	20,000	207	1,500	.....	1,910	35,600	Me	Me	Me	Re	.....	.....	.....	.....	Re Wh	Me
37′ 1″	32′ 3″	11′ 2″	266	.....	.....	.....	7,940	422	21,000	219	1,500	.....	3,780	.....	Me	Me	Me	Re	.....	.....	.....	.....	Re Wh	Me
39′ 4″	29′ 3″	13′ 3″	253	.....	.....	5,623	7,717	407	19,700	288	1,500	.....	.....	40,000	Me	Me	Me	Re	.....	.....	.....	.....	Re Wh	Me
35′ 11″	28′	12′	.....	.....	.....	2,392	3,197	.....	.....	92	.....	.....	.....	.....	.....	.....	.....	Fl	.....	.....	.....	.....	.....	.....
47′ 3″	37′ 7″	14′ 7″	372.5	.....	.....	6,770	10,460	346	16,600	282	1,500	.....	2,530	.....	Me	Me	Me	Re	.....	.....	.....	.....	Re Wh	Me
66′ 7″	54′	.....	684	.....	.....	14,730	23,523	305	18,700	184	1,500	.....	1,505	30,930	Me	Me	Me	Re	.....	.....	.....	.....	Fx Wh	Me
65′ 3″	31′ 9½″	13′	216	.....	.....	.....	7,320	417	16,600	318	1,500	.....	4,835	38,800	Me	Me	Me	Re	134	.....	.....	.....	Re Wh	Me
49′	36′	.....	395	.....	.....	6,300	12,070	318	19,500	183	1,500	.....	1,920	33,400	Me	Me	Me	Re	.....	.....	.....	.....	Re Wh	Me
37′ 9½″	35′ 8″	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Me	Me	Me	Re	.....	.....	.....	.....	Re Wh	Me
38′ 3″	101′ 9″	.....	2,230	.....	.....	40,000	75,000	270	16,100	166	1,500	.....	1,180	29,100	Me	Me	Me	Re Tri	.....	.....	.....	.....	.....	Me
.....	.....	.....	.....	.....	.....	.....	.....	437	26,250	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
41′ 1″	35′ 6″	14′ 5¾″	274	.....	.....	6,340	9,920	403	22,100	239	1,500	.....	2,910	36,100	Me	Me	Me	Re	.....	.....	.....	.....	Re Wh	Me
45′ 8″	37′ 6″	16′ 3″	.....	.....	.....	9,020	10,780	320	19,700	207	.....	.....	.....	.....	Me	Me	Me	Fl	.....	.....	.....	.....	.....	Me
75′ 10″	61′ 4″	18′ 4″	709	.....	.....	.....	30,900	346	18,700	265	1,500	.....	1,665	30,100	Me	Me	Me	Re	.....	.....	.....	.....	Re Wh	Me
39′ 4″	33′ 4″	14′	253	.....	.....	6,060	7,700	302	19,700	.....	.....	.....	.....	.....	Me	Me	Me	Fl	.....	.....	.....	.....	.....	Me
36′ 1″	29′ 5″	.....	.....	.....	.....	5,645	8,380	395	19,700	288	1,500	.....	.....	0,000	Me	Me	Me	Re	.....	.....	.....	.....	.....	Me
36′ 5″	31′ 8″	11′ 8″	.....	.....	.....	.....	.....	420	29,000	.....	.....	.....	.....	.....	Me	Me	Me	Re Tri	179½″	.....	.....	.....	.....	Me

FRENCH AIRCRAFT

2′ 3½″	56′ 8¼″	.....	.....	.....	.....	.....	33,600	.....	286	10,000	250	6,500	.....	.....	.....	.....	.....	Re Tri	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	26,900	.....	.....	.....	240*	.....	.....	.....	.....	Me	Me	Me	Re	.....	.....	.....	Re Wh	Me
.....	.....	.....	.....	.....	.....	.....	.....	.....	248	.....	220	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6′ 5″	.....	.....	.....	.....	.....	.....	37,600	267	.....	.....	.....	.....	.....	.....	Me	Me	Me	Re	.....	.....	.....	.....	Re Wh	Me
8′ 5″	78′ 9″	.....	.....	.....	.....	.....	23,207	282	.....	.....	.....	.....	.....	35,200	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3′ 10″	36′	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5′ 7″	.....	.....	.....	.....	.....	.....	7,330	.....	.....	.....	.....	.....	.....	.....	Me	Me	Me	.....	.....	.....	.....	.....	.....	Me
1′ 9″	.....	.....	.....	.....	.....	.....	.....	.....	155	.....	135	.....	.....	.....	.....	.....	.....	Fx Tri	.....	.....	.....	.....	.....	.....

tary purposes; two built
n Car & Foundry Co.
of four wheels, each retract-

[12] To top of fuselage.
[13] Crew of four housed in pressurized cabin forming fuselage nose. Had electrically-operated remote control gun turrets.

[14] Designed for two 5,500-7,000-lb thrust turbojets. Wing swept forward 25 deg.
[15] Auxiliary 660-lb. thrust rocket extended cruising time to twelve min. Also built by Japs as Shusui

[16] Rocket-propelled suicide craft.
[17] Submarine-borne reconnaissance craft.
[18] Pusher canard type. One built, not used in combat.

Sikorsky R-4B

First rotary wing aircraft to go in widespread military service, this type was used for rescue, liaison and observation in practically every theater of operation, and was utilized by Army, Navy and Coast Guard. A two-place craft powered by a 185-hp. Warner Super-Scarab engine, it has a gross wt. of 2,530 lb., and empty wt. of 2,011 lb. Its single, three-blade main rotor has a diameter of 38 ft. and three-bladed torque compensation rotor is 7 ft. 8 in. in diameter. Fuselage is of welded steel tubular construction, fabric covered. Fixed three wheel landing gear can be replaced by floats for overwater operations.

Sikorsky YR-5A

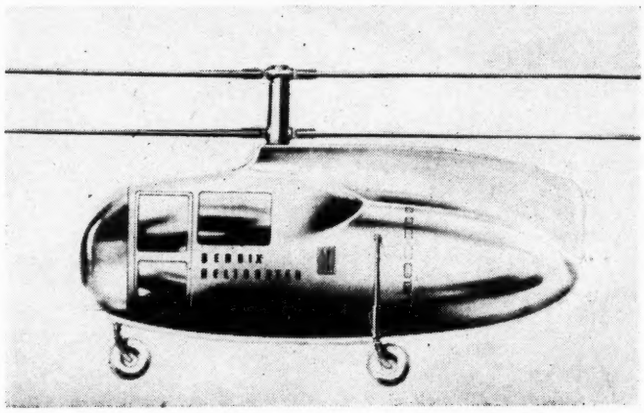
Two-seater developed for AAF has 450-hp. P&W Wasp, main rotor disk diameter of 48 ft., tail rotor disk diameter of 8 ft. 5 in., and height of 12 ft. Recently established new NAA records by climbing to 21,000 ft. without payload; speed for 20 km., 114.6 mph. without payload; altitude with 11,000-lb., 16,000 ft.; speed for 20 km. with 1,100-lb. payload, 110 mph.; and speed for same distance with 1,650-lb. payload, 105 mph. Figures subject to confirmation. In a demonstration of lifting capacity, craft has taken off with 18 passengers; 2 crew and 16 seated on outboard platforms attached to fuselage. All-metal construction, metal covering. Latest model is YR-5E commercial four-place development now under construction and expected to fly this Spring. Designated S-51, it is very similar to YR-5, and has same power plant. Landing gear is fixed tricycle. Gross weight about 4,900 lb.

Sikorsky R-6

Latest Sikorsky military model to go into production, this type was built under license by Nash-Kelvinator Corp. It is also used by Navy under designation HO2S-1. A two-place tandem craft powered by a 245-hp. Franklin engine, it has a high speed of 100 mph., a cruising range of approximately 450 mi., and an initial climb of 2,000 fpm. Gross wt. is 2,600 lb., and empty wt. is 2,016. Main three-bladed rotor is 38 ft. in diameter and has tapered chord. Torque compensating rotor is also three-bladed, and is just over 7 ft. in diameter. Fuselage is all-metal construction and landing gear is fixed four wheel type, the front and rear wheels being smaller than main gear.

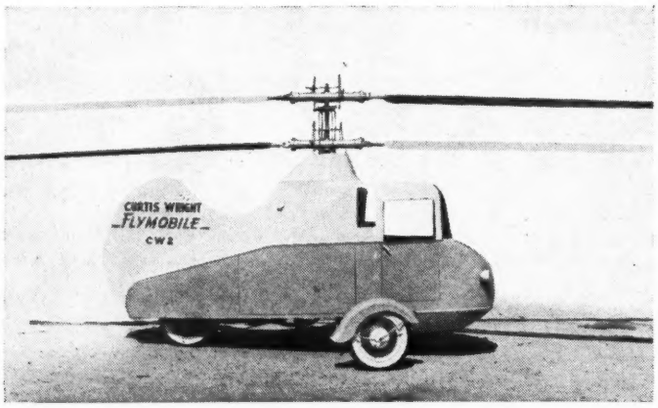
Aeronautical Products 3-A

A two-place experimental craft which has 165-hp. Franklin engine mounted in front of cabin, with drive to rotors through series of V-belts. With fuel capacity of 20 gal., range is 175 mi. High speed is 100 mph., cruising speed is 80 mph. and initial climb is 1,100 fpm. Gross wt. is 1,650 lb.



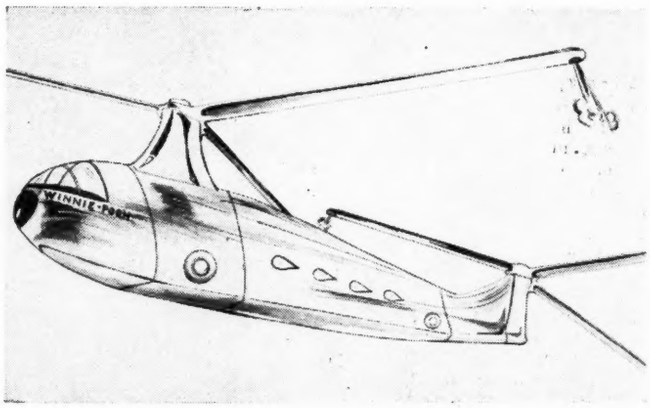
Bendix Model I

Four-place or cargo carrier predecessor to peacetime civil version which will be similar in many respects. With 300 hp. engine sea level high speed is 120 mph., cruising speed is 105 and initial climb is 900 fpm. Co-axial blades have 40-ft. diam. Fuselage is all-metal and landing gear is tricycle.



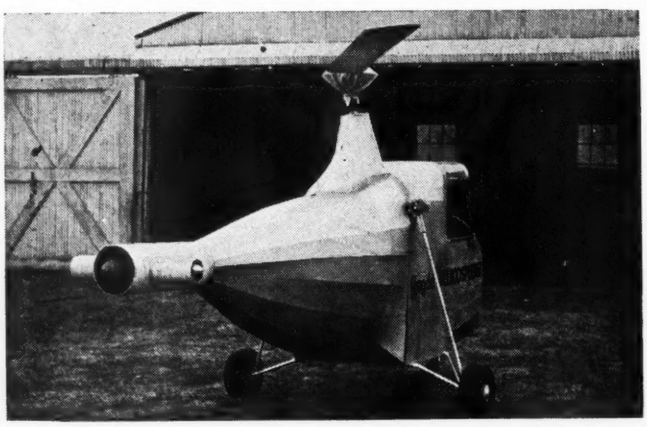
Curtis Wright Industries

Two-place roadable type with co-axial rotor. Powered by 90-hp. Franklin, design high speed is 100 mph. at sea level; cruising speed is 80 mph. and, with 26-gal. fuel capacity, range is given as 300 mi. Gross wt. is 1,725 lb., net wt. is 1,200 lb. Power for surface operation goes to rear wheel.



Clark Electronics Project

Now in preliminary design stage, this 8-passenger craft is to be turbojet-powered, with jet exhausts through tips of three-bladed tandem rotors of 26-ft. diameter. Designers are aiming at high speed of 900 mph. at 50,000 ft., with cruising speed between 300 and 500 mph. Craft is to be all-metal.

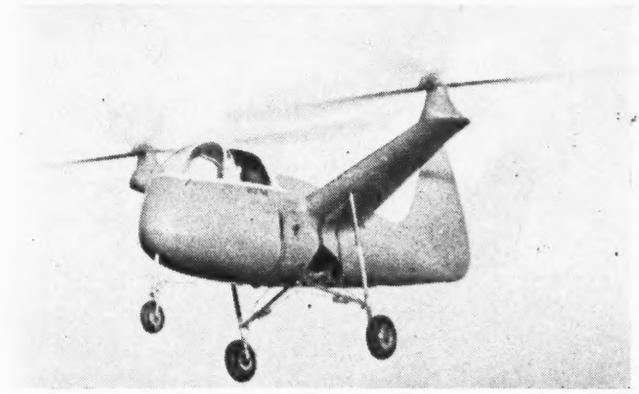


Gazda Engineering Helicospeeder

Conventional reciprocating engine is used for lifting and hovering power while turbojet is employed for forward motion and torque compensation, the latter by diverting part of this power through nozzles extending from either side of exhaust pipe. Design high speed is 180 mph., cruising speed set at 150 mph.

Kellett XR-8

Developed for AAF, features intermeshing contra-rotating side-by-side three bladed rotors of 36-ft. diam. A two-place craft, its 245-hp. Franklin engine gives high speed of 104 mph., cruising speed of 85 mph. and initial climb of 1,250 fpm. Company is now developing XR-10, data restricted.

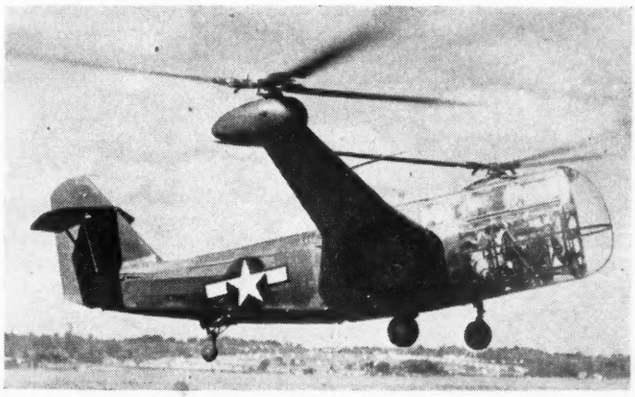


Landgraf H-2

Single-place prototype serving as flying laboratory for development of both military and civil craft. Side-by-side contra-rotating rotors have solid spruce spars and plywood covering. Fuselage is also of all-wood construction. With modified 85-hp. Pobjoy engine high speed is over 100 mph.

P-V Engineering Forum PV-2

Single-place prototype used to test design features embodied in PV-3 and to be used in other small civil craft. Ninety-hp. Franklin engine gives high speed of about 100 mph., cruising speed of 85 mph. and initial climb of 1,100 fpm. Main rotor is fabric-covered steel tube construction, cruising at 371 rpm.

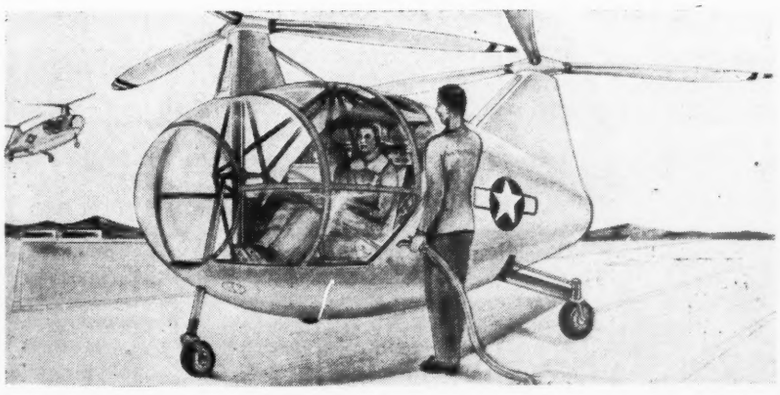


Platt-LePage XR-1

Two-place tandem seater powered by 450-hp. Pratt & Whitney Wasp Jr., giving high speed of 115 mph., cruising speed of 95 mph., initial climb of 1,500 fpm., and service ceiling of 15,000 ft. With 100-gal. fuel capacity, range is 400 mi. Metal rotor blades being developed for PL-3, a commercial version.

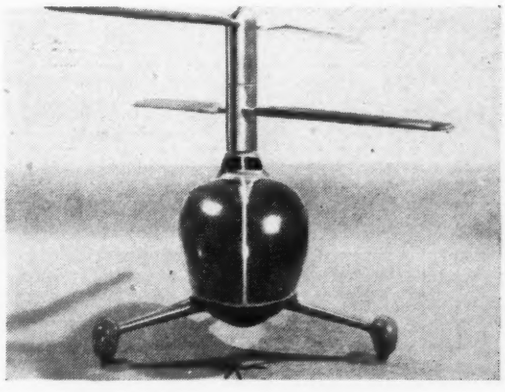
P-V Engineering Forum PV-3

Built for the Navy, designated XHRP-1, this craft features tandem contra-rotating three bladed rotors. Powered by one Continental Wright R-975 of 450 hp., craft is designed to carry crew of two and ten passengers in rescue work. Fuselage is fabric covered welded steel tubular construction.



Rotor-Craft XR-11 Dragonfly

Being developed for Army Air Forces, scheduled for initial test flights early this year. Design performance figures are restricted. Powerplant is 100-hp. Continental. Two tandem contra-rotating three-bladed rotors have 18-ft. diameter, having rotor disk loading of 2 lb., and power loading of 11 lb.



United Helicopters C-3 Commuter

Now under development by Stanley Hiller this craft will be powered by 150-hp. Lycoming and is designed for high speed of 120 mph., cruising speed of 90 mph., initial climb of 1,650 fpm. and, with 20-gal, fuel capacity, a range of 200 mi. Coaxial rotor blades and fuselage are all metal construction.

AVIATION'S TURBOJET SPECIFICATIONS

Manufacturer	Model	Type	Compressor stages	Turbine stages	Thrust lb., static SL.	At rpm.	Speeds, rpm. Max.	Speeds, rpm. Cruise	Speeds, rpm. Idling	Pressure ratio	Fuel flows: Fuel flow (gpm)	Fuel flows: Spec. fuel cons. lb./hr./lb. thrust	Temperatures (F): Comp. discharge temperature	Temperatures (F): Turb. inlet temperature	Temperatures (F): Exhaust temperature	Air flow (lb./sec.)	Dimensions: Intake area (sq. in.)	Dimensions: Turb. nozzle area (sq. in.)	Dimensions: Exhaust jet area (sq. in.)	Dimensions: Overall length (in.)	Dimensions: Overall diam. (in.)	Weights (lb.): Dry	Weights (lb.): Accessories	Weights (lb.): Total	Weights (lb.): Specific
AMERICAN																									
General Electric	I-A[1]	CR	1	1	1,400	16,500						1.3			1,200										
	J-31 I-16[2]	CR	1	1	1,650	16,500	16,500	15,500	5,600	3.75	5.4	1.18	380	1,485	1,180	32.9		54	120.86	70	41.5	825	63	1,054	.527
	J-33 I-40	CT	1	1	4,000	11,500	11,500	11,000	3,500	4.126	13.15	1.185	413	1,492	1,170	79		121.3	283.52	101.5	48	1,820.7	138.3	1,957	
	XT-8 TG-100	CP	1	1	All	data	res	tricted																	
	J-35 TG-180	A	11		All	data	res	tricted																	
Westinghouse Electric	19-B[3]	A	6	1	1,365	18,000	18,000	16,000		33				1,500		28				104½	19	765	61	826	
	9.5-B[4]				275		34,000																	145	.527
	24-C				All	data	res	tric	ted																
BRITISH																									
Armstrong Siddeley Co.	ASX	A	14	2	2,800	8,000						1			1,103									1,900	.731
	ASP	P	14	2	1,100[5]																				
Bristol	Theseus 1[6]	CTP	1	3	2,000																	2,310			
de Havilland	Goblin 1				2,000																				
	Goblin 2	CT	1	1	3,000	10,300						1.23			1,238									1,500	.5
Metropol.-Vickers	F2/4	A	10	1	3,500	7,700						1.05			625					159	36.75			1,750	
Power Jets, Ltd. (Whittle)	W1[7]	CR	1	1	1,855	17,750									1,148									623	
	W2/500	CR	1	1	1,850	16,750	16,500			3.75	5.4	1.12	380	1,485	1,180	32.9		54		101.5	48				
	W2/700	CT	1	1	2,485	16,750						1.05			1,196										
Rolls-Royce	Welland	CT			1,600	16,750						1.12			1,112						43	850			1.86
	Derwent 1	CT			2,000	16,500		15,000	5–6000	3.9	6.55	1.18			1,274			60.4		84	42.5	1,000			2.08
	Derwent 5				3,500	14,400*						1.05			1,220									1,250	2.78
	Nene	CT	1	1	4,000	11,800	12,550*					1.06			1,067					97	49.5	1,550			.31
	Trent	CTP			1,250[8]																				
GERMAN																									
BMW	003D	A	8	2	2,420	10,000	10,000	9,500	2,000	3.5	7	1.10		1,472	1,382	42			155–220	124	27.1			1,430	
	018	A	12	3	7,500	6,000				7															
	028	AP	12	4	8,000						22.7													7,700	
Heinkel	S3B[9]	ACR			1,000																				
	S8	A			1,500																			840	
	011	CA	4[10]	2	2,860	11,000	9,000					1.31								102	36*			2,000*	.731
Junkers	004	A	8	1	1,970	8,700	8,700		3,080	3	10.9	1.375–1.39	776*	1,382			921			152	34	1,551	224	1,775	.85
	012	A	11	2	6,400						18.5	1.2								204				4,400	

Key to abbreviations: *Approximate A — Axial flow C — Centrifugal CR — Centrifugal, reverse flow CT — Centrifugal, through flow P — Propeller drive

[1]First American turbojet; built from Whittle drawings.
[2]First American production turbojet, incorporating developments from 1-A.
[3]First all-American design, and first American axial flow type.
[4]Used in Navy guided missile program.
[5]Plus 3,600 shp. Engine basically same as ASX but incorporates propeller drive.
[6]Unit is axial-cum-circumferential, compressor delivering air through heat exchanger to 8 combustion chambers, then to 3 turbines, first two of which drive compressor and auxiliaries, and third driving propeller through epicyclic reduction gear. Gases then go through hot side of heat exchanger to exhaust jet.
[7]Original Whittle design; first British turbojet.
[8]Basically same as Nene with propeller drive, delivering 750 hp. in addition to jet thrust.
[9]First successful turbojet; flew in Heinkel HE-178 on Aug 27, 1939.
[10]Had centrifugal impeller and 3 axial compression stages.
[11]Later development, 022, was similar but incorporated propeller drive.

AVIATION'S HELICOPTER SPECIFICATIONS

Manufacturer	General: Designation or Model No.	Type	No. seats	Make of engine	Performance: Rated hp. each	At altitude, ft.	Fuel capacity, gal.	Normal range, mi.	High speed	At altitude, ft.	Cruising speed	At altitude, ft.	Climb at sea level	Service ceiling	Weights: Gross wt.	Net wt.	Rotor disk loading	Power loading	Main Rotor Data: No. of rotors	Blades per rotor	Diameter	Chord (in.)	Rotor blade area sq. ft. (total)	Rotor rpm., cruising	Spar construction	Blade covering	Antitorque Rotor: No. blades	Diameter	Rotor rpm., cruising	Spar construction	Fuselage: Construction	Covering	Landing Gear: Type	Shock unit	Tread
Aeronautical Products, Inc	3-A	CL	2	1 Franklin	165	SL	20	175	100	SL	80	SL	1,100	11,000	1,650	1,100	2.34	11	1	3	30′	12″	45	250	ST	Fab	2	5′ 8″	1,500	ST	WldSt	Fab	Wh Sk	Hyd	95
Bell Aircraft Co.		CL	2	1 Franklin	160	SL			100	SL	80–90	SL	480+		1,400*				1	2	33′				Sol W		2	5′		Sol W	ST	Fab	Fx Tri	Hyd	
Bendix Helicopters, Inc.	Model I[1]	CL	4	1	300	SL	75	420	120	SL	105	SL	900		3,036	1,925	2.41	10.64	2 Co	2	40′			215				none			Me	Me	Fx Tri	Ol	108
Clark Electronics		CL	10	1 turbojet					900*	50,000*	400*	50,000			15,000*				2T	3	26′*							none			Me	Me	4 Re Wh	Ol	
Curtis Wright Industries	CW-2 Flymobile	CL	2	1 Franklin	90	SL	26	300	100	SL	80	SL			1,725	1,200	2.3	19.15	2 Co	2	26′	12″	520[2]	300	ST	Pl		none			ST	Fab	Fx Tri	CoilSp	72
Gazda Engineering	Helicospeeder	CL	2	1 recip & 1 turbojet[3]					180		150				1,200				1	2	25′							Jet			ST	Fab	Fx Tri		89
Higgins Industries	EB-1	CL	2	1 Warner	180	SL			125*										1	4	32′						2					Me Fab	Fx Tri		
Kellett Aircraft Corp.	KH-1	CL	2	1 Franklin	245	SL	81.5	465	104	SL	85	SL	1,250		2,779	2,123	2.38	13.42	2 I	3	36′	12″–7″	90	230	ST	Ply		none			ST	Me Fab	Fx Tri	Hyd	120
	KH-2				Re	st	ri	ct	ed																										
Landraf Helicopter Co.	H-2	CL	1	1 Pobjoy R.	85	SL	6.5		100+	SL					850	636	2.36	10	2 I	3	16′	8.1″[4]	32.4	485	Sol W	Ply		none			W	Ply	Re Tri	Air Ol	68
P-V Engineering Forum	PV-2	CL	1	1 Franklin	90	SL			90–100	SL	85	SL	1,100	10,000	1,000	750	2.04	11.1	1	3	25′	9.5″	19.6	371	ST	Fab	2	5′	1,670	W	ST	Fab	Wh Sk	SpHyd	96
	PV-3	CL	12	1 Con. Wright R-975.	Re	st	ri	ct	ed										2 T	3								none			ST	Fab	Fx Tri		
Platt LePage Aircraft Co.	PL-3[5]	CL	2	1 P&W	450	SL	100	400	115	SL	95	SL	1,500	15,000	5,200	3,980	3.3	11.5	2 S	3	31.5′	11″	86	285	ST	WFab		none			ST	Me Fab	Fx	Air Ol	144
Rotawings, Inc.	Rota-Airbus	CL	9																1	3							3						Fx Tri		
Rotor-Craft Corp.	X-2A Dragonfly[6]	CL	2	1 Continental	100	SL	6		Re	st	ri	ct	ed		1,100*	700*	2	11	2 T	3	18′		35					none			ST	Fab	Fx Tri	Hyd	80
Sikorsky Div., United Aircraft Corp.	VS-316A	CL	2	1 Warner R-500	185	SL									2,530	2,011			1	3	38′	Taper					3	7′ 8″			ST	Fab	Wh Sk		
	R-5	CL	2	1 P&W Wasp Jr.	450	SL									4,800	3,725			1	3	46′	Taper					3				Me	Me	Wh		
	HO2S-1, R-6	CL	2	1 Franklin	245	SL			450*		100		2,000		2,600	2,016			1	3	38′	Taper					3	7′+			Me	Me	4 Wh		
	S-51	CL	4	1 P&W Wasp Jr.	450	2,300	100	245	103		80		1,200	1,300	4,900	3,650			1	3	48′			285			3	8′ 5″			Me	Me	Fx	Ol	144
United Helicopters, Inc.	C-3 Commuter	CL		1 Lycoming	150	SL	20	200	120	SL	90	SL	1,650	10,000	1,600	1,080	1.99	10.7	2 Co	2	32′			260	ST	Me					ST	Me	3 Wh	Ol	108

Key to Abbreviations: *Approximate Co — Coaxial I — Intermeshing S — Side by side T — Tandem

[1]Specifications for 4-place civil helicopter, comparable in many respects to Model I will be released shortly.
[2]Refers to disk area.
[3]Reciprocating engine used for hovering. Terminal turbojet for forward motion and torque compensation.
[4]Average—tapered chord.
[5]Navy version; being further developed for commercial version.
[6]Flight tests scheduled for early 1946.

Aviation's Directory of Aircraft and Helicopter Manufacturers

Aero Design & Engineering Corp., Culver City Airport, Culver City, Calif., Pres., Dir. Pub. Rel., Pur. Agt.—T. R. Smith; V. P.—R. T. Oelschlager, A. H. Moore; Sls. Mgr.—C. W. Sawhill; Ch. Engr.—C. W. Gaskell, Jr.; Ser. Mgr.—E. A. Wolford

Aerobat Aircraft, 1421 Hayes St., Brownsville, Tex., Co-Owners—E. V. & Mrs. E. V. Eichman; Adv. Mgr.—R. D. Morris; Ch. Engr.—R. C. Wade; Maint. Engr.—H. Harrison

Aeronca Aircraft Corp., Municipal Airport, Middletown, Ohio, Pres.—J. W. Friedlander; Exec. V. P.—E. L. Sutherland; V. P.—C. Friedlander; Dir. Sls.—A. B. Bennett; Adv. & Dir. Pub. Rel.—B. L. Hinds; V. P. & Dir. Pur.—E. H. Wideman; Ch. Engr.—R. Hermes; Ser. & Pts. Mgr.—L. B. Nelson

All American Aircraft, Inc., Long Beach 4, Calif., Pres.—G. R. Adler; V. P. & Ch. Engr.—R. C. Adler; Sls. Mgr.—K. E. Robertson; Dir. Pub. Rel.—N. Masterson

Beech Aircraft Corp., Wichita, Kansas. Pres.—W. H. Beech; V. P. & Gen. Mgr.—J. P. Gaty; V. P. & Ch. Engr.—T. A. Wells; V. P. in chg. Pur.—R. K. Beech; V. P. & Co-ord.—F. E. Hedrick

Bellanca Aircraft Corp., New Castle, Del., Pres.—G. M. Bellanca; V. P.—I. I. Islamoff, A. F. Haiduck, H. N. Hunt; Sls. Mgr.—H. A. Hershfield, Jr.; Adv. Mgr.—H. L. Thompson; Pur. Agt.—R. F. Wright; Ch. Engr.—H. Toppin

Bendix Helicopters, Inc., 50 Rockefeller Plaza, N. Y., N. Y., Pres.—C. L. Barnes; V. P.—M. Jensen; Dir. of Field Activities—C. L. Morris

Boeing Aircraft Company, Seattle 14, Wash., Chmn.—C. L. Egtvedt; Pres.—W. M. Allen; V. P.—H. O. West; Sls. Mgr.—F. B. Collins; Dir. Pub. Rel.—H. Mansfield; Adv. Mgr.—C. M. Cleveland; Nat'l Mgr.—C. B. Gracey; Ch. Engr.—E. C. Wells; V. P. Engr.—W. E. Beall; Opr. Mgr.—R. A. Neale; Gen. Fact'y Supt.—L. A. Searle; Per. Mgr.—L. Isaacson

Call Aircraft Co., Afton, Wyo., Gen. Mgr.—R. Call; Ch. Engr.—S. Call

Commonwealth Aircraft, Inc., Fairfax Airport, Kansas City, Kan., Pres.—R. Noyes; Sls. Mgr.—J. E. Cregier, Jr.; Dir. Pub. Rel. & Adv.—R. Shannon; Ch. Engr.—C. Brent

Consolidated Vultee Aircraft Corp., San Diego, Calif., Pres.—H. Woodhead; Exec. V. P.—I. M. Laddon; V. P. Finance—F. A. Callery; V. P. Sls.—W. A. Blees; Dir. Pub. Rel.—J. B. Avery; Adv. Agency—Young & Rubicam; Pur. Agt.—A. W. Larsen

Curtis Wright Industries, 1240 San Fernando Rd., Los Angeles 31, Calif., Owner & Gen. Mgr.—Curtis Wright; Ass't Gen. Mgr.—H. Clark; Prod. Mgr.—O. B. Hanson; Test Engr.—H. Lord

Curtiss-Wright Corp., 30 Rockefeller Plaza, N. Y. 20, N. Y., Pres.—G. W. Vaughan; V. P.—R. I. Earle; Dir. Pub. Rel.—J. W. Sweetser; Dir. Ind. Rel.—I. L. Willis

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Engineering & Research Corp., Riverdale, Md., Pres.—L. A. Wells; V. P.—M. W. King; Dir. Sls. & Serv.—G. F. Ryan; Sls. Mgr.—H. Agerter; Adv. Agency—Dorland International, Pettingell & Fenton; Pur. Agt.—E. P. Scully; V. P. Ch. Engr.—F. E. Weick; Maint. Engr.—H. L. Walker

Eshelman Co., The, Cheston L., Keyser Bldg., Baltimore 2, Md., Pres.—Cheston L. Eshelman; V. P.—S. S. Zell; Ch. Engr.—F. K. Kriz

Fairchild Engine & Airplane Corp., 30 Rockefeller Plaza, New York 20, N. Y., Chmn. of the Board—Sherman M. Fairchild; Pres.—J. Carlton Ward, Jr.; V. Ps.—M. B. Gordon & H. H. Budds; Dir. Pub. Rel.—J. E. Lowes, Jr.

Fairchild Aircraft Div. of Fairchild Engine & Airplane Corp., Hagerstown, Md., Pres.—J. Carlton Ward, Jr.; V. P. & Gen. Mgr.—R. S. Boutelle; Transport Sls. Mgr.—C. Roggi; Mgr. Per. Plane Sls.—L. H. Smith; Mgr. Pub. Rel.—E. T. McClanahan; Pur. Agt.—G. W. Jaynes; Ch. Engr.—A. Thiebolt; Asst. Gen. Mgr.—P. J. Frissell; Gen. Ser. Mgr.—J. E. Steinhauer; Works Mgr.—W. L. Landers

Gladden Products Corp., 635 W. Colorado, Glendale 4, Calif., Pres. & Gen. Mgr.—J. N. Gladden; Sls. Mgr.—W. P. Stratton; Controller—J. M. Wilson; Ch. Engr.—J. G. Kuhn

Globe Aircraft Corp., Fort Worth, Tex., Pres. & Gen. Mgr.—J. Kennedy; Ass't to Pres. & Dir. Pub. Rel.—N. Nicholson; V. Ps.—C. R. Starnes & C. D. Reimers; V. P. Engr.—K. H. Knox; Ass't V. P. Sls.—W. G. Fuller; Ass't V. P. Prod.—J. Shirkey; Sls. & Adv. Super.—J. H. Howell; Ch. Engr.—J. F. Steppe; Pur. Agt.—R. S. Hershberger; Per. Dir.—R. F. Brewer

Grumman Aircraft Engineering Corp., Bethpage, N. Y., Pres.—L. R. Grumman; Exec. V. P.—L. A. Swirbul; V. P.—W. T. Schwendler & E. C. Towl

Harlow Aircraft Co., Alhambra Airport, 620 Valley Blvd., Alhambra, Calif., Pres.—H. F. Keenan; V. P. & Gen. Mgr.—F. Der Yuen; Sls. Mgr.—J. A. Beach; Dir. Pub. Rel.—M. H. Gray; Pur. Agt.—C. R. Howe; Ch. Engr.—D. C. Mendenhall; Maint. Engr.—K. Owen

Harlow, Max B., 2112 Oakdale St., Pasadena 8, Calif., Designer—M. B. Harlow

Hockaday Aircraft Corp., 60 East Orange Grove, Burbank, Calif., Pres.—N. R. Hockaday; Sls. Mgr.—A. A. Swanson; Ch. Engr.—R. Eddie; Maint. Engr.—N. Kort; Supt. of Mfg.—H. K. McGuire

Hughes Aircraft Co., Culver City, Calif., Pres.—H. R. Hughes; V. P.—C. W. Perelle; Dir. Pub. Rel.—A. Burke; Pur. Agent.—A. H. Bellue; Ch. Engr.—R. E. Hopper; Maint. Engr.—J. Stearns; Dir. Ind. Rel.—T. H. Sisk; Bus. Mgr.—D. H. Evans; Dir. Ser. & Flight—G. E. Odekirk

Jarvis Manufacturing Co., 924 Thompson Ave., Glendale 1, Calif., Pres.—S. M. Jarvis; V. P.—B. Jarvis; Sls. & Adv. Mgr.—D. Bentley; Dir. Pub. Rel.—B. Shreffler; Pur. Agt.—C. Hasentab; Ch. Engr.—V. Jensen; Maint. Engr.—E. Wuertz

Kaiser Cargo, Inc. Fleetwings Div., Bristol, Pa., Pres.—E. E. Trefethen, Jr.; V. P. & Gen. Mgr.—S. D. Hackley; Mgr.—L. J. Kelly; Pur. Agent.—A. Daniel; Ch. Engr.—G. G. Cudhea; Maint. Engr.—M. Roesch; Fact'y Mgr.—L. E. Steele

Kellett Aircraft Corp., Lansdowne Ave. above State Road. Upper Darby, Pa., Pres.—W. W. Kellett; Exec. V. P.—R. G. Kellett; V. P. & Contracts—L. C. Peskin; Dir. Pub. Rel. & Adv.—W. L. Wilson; Pur. Agt.—I. King; V. P. & Ch. Engr.—R. H. Prewitt; Dir. Mfg.—N. F. Vanderlipp

Landgraf Helicopter Co., 1440 W. 166 St., Gardena, Calif., Pres. & Ch. Engr.—F. Landgraf; V. P.—J. S. Ricklefs

Lockheed Aircraft Corp., 2555 No. Hollywood Way, Burbank, Calif., Chmn. & Pres.—R. E. Gross; V. P. & Gen. Mgr.—C. S. Gross; V. P. & Sls. Ser.—C. B. Squier; V. P. Admin.—C. Chappellet; V. P. Mfg.—H. E. Ryker; V. P. & Ch. Engr.—H. L. Hibbard; V. P. Special Projects—M. Short; Dir. Pur.—J. L. Wells; Pur. Agt.—R. Osborn; Dir. Ind. Rel.—W. W. Aulepp; Mgr. Pub. Rel.—J. E. Canaday; Sls. Mgr.—L. K. Schwartz; Gen. Ser. Mgr.—R. C. Stunkel; Sls. & Adv. Mgr.—B. W. Holloway; Pub. Mgr.—E. Foster; Ch. Res. Engr.—C. L. Johnson

Luscombe Airplane Corp., Dallas, Tex., Pres.—L. H. P. Klotz; Sls. Mgr.—D. Hayward; Adv. Mgr.—R. X. Smith; Ch. Engr.—E. W. Norris

LeMars Mfg. Co., LeMars, Iowa, Pres.—R. E. Tool; V. P.—D. O. Kime; Pur. Agt.—L. W. duVon; Ch. Engr.—W. Olsen

Martin, The Glenn L., Co., Baltimore 3, Md., Pres.—G. L. Martin; Exec. V. P.—H. T. Rowland; Com. Sls. Mgr.—P. Magruder; Dir. Pub. Rel & Adv. Mgr.—A. McBee; Pur. Agt.—C. W. Chidester; Maint. Engr.—P. E. Tignor; V. P. chg. Planning Material—G. T. Willey; V. P. chg. Mfg.—H. F. Vollmer; V. P. chg. Engr.—W. K. Ebel

Midwest Aircraft Co., Hance Airport, Wyandotte, Mich., Pres.—P. L. Shultz; V. P. & Ch. Engr.—R. J. Saxon; Sls. Mgr.—J. W. Hance

Nelson Aircraft Corp., P.O. Box 750, San Ferando, Calif., Pres.—T. Nelson; V. P. & Ch. Engr.—W. H. Bowlus; Sls. Mgr.—L. J. Rose; Adv. Agency—Rider & Ingraham

Northrop Aircraft, Inc., Northrop Field, Hawthorne, Calif., Pres. & Ch. Engr.—J. K. Northrop; V. P.—G. Irving; Sls. Mgr.—J. W. Myers; Dir. Pub. Rel & Adv. Mgr.—D. Armstrong; Pur. Agt.—P. Ogden; V. P. Ind. Rel.—R. Biron

North American Aviation, Inc., Inglewood, Calif., Pres. & Gen. Mgr.—J. H. Kindelberger; First V. P.—J. L. Atwood; V. P. & Ch. Engr.—R. H. Rice; Mfg. V. P. & Fact'y Mgr.—J. S. Smithson; Ass't to Pres.—Sls.—R. L. Burla; Dir. Ind. Rel.—M. E. Beaman; Dir. Pub. Rel.—P. K. Macker

Piper Aircraft Corp., Lock Haven, Pa., Pres.—W. T. Piper, Sr.; V. P. & Adv. Mgr.—T. V. Weld; Gen. Sls. Mgr.—W. B. St. John; Dir. Pub. Rel.—G. Vincent; Pur. Agt.—R. C. McKissick; Ch. Engr.—W. C. Jamouneau; Maint. Engr.—H. Lovett; Per. Dir.—H. H. Harrett

Platt-LePage Aircraft Co., P. O. Box 59, Chester, Pa. Pres. & Ch. Engr.—W. L. LePage; V. P. Res. & Dev'l.—H. H. Platt; Ass't. Ch. Engr.—R. A. Price; Admin. Ass't to Pres.—J. E. Dempsey; Shop Sup't., N. H. Sanderson

P-V Engineering Forum, Inc., Elmwood Ave. above Calcon Hook Rd., Sharon Hill, Pa., Pres.—F. N. Piesecki; V. P. & Ch. Engr.—E. Daland V. P. & Wks. Mgr.—H. S. Pack; Pur. Agt.—H. S. Glasby

Republic Aviation Corp., Farmingdale, N. Y., Pres.—A. Marchev; Exec. V. P. & Gen. Mgr.—C. H. Miller; V. P. Sls.—M. I. Peale; V. P. Engr.—A. Kartveli; Dir. Pub. Rel & Adv. Mgr.—K. Ellington; Pur. Agt.—L. Cunningham

Rotor-Craft Corp., 4358 W. 3 St., Los Angeles 5, Calif., Pres.—G. W. Magill; Sls. Mgr.—J. R. Brigham; Ch. Engr.—P. J. Servaas; Adv. Mgr.—L. J. Weber; Pur. Agt.—C. V. Jones

Sikorsky Aircraft Div. of United Aircraft Corp., South Ave., Bridgeport, Conn., Gen. Mgr.—B. L. Whelan; Engr. Mgr.—I. I. Sikorsky; Ch. Engr.—M. E. Gluhareff; Fact'y Mgr.—J. L. Brown, Jr.; Pur. Agt.—C. L. Beers

Skylark Mfg. Co., Inc., 350 Washington Blvd., Venice, Calif., Pres.—F. G. Perkins; V. P.—E. A. Perkins; Sls. Mgr.—C. West; Dir. Pub. Rel.—V. H. Pinckney; Adv. Mgr.—G. Mitchell; Pur. Agt.—F. H. Perkins; Ch. Engr.—E. F. Zap; Maint. Engr.—G. M. Reed

Spartan Aircraft Co., 1900 Sheridan Rd., Tulsa, Okla., Pres.—J. P. Getty V. P.—M. W. Balfour; Plant Mgr.—H. E. Kraus; Pur. Agt.—H. S. Nubemyer; Ch. Engr.—W. F. Stewart

Taylorcraft Aviation, Div. Detroit Aircraft, Inc., Alliance, Ohio, Pres. & Sls. Mgr.—N. Russ; V. P.—B. Russ; Dir. Pub. Rel. & Adv. Mgr.—J. F. Masterson; Pur. Agt. P. Waldeck; Ch. Engr.—D. Romick; Maint. Engr.—J. R. Riley, Jr.; Ass't Pres. On Dist.—O. M. Bell; Per. Dir.—G. A. Bennett; Ass't Gen. Mgr.—W. E. Staff, Jr. Wks. Mgr.—F. Drawe

Tennessee Aircraft, Inc., Skyfarer Div. of Gen. Aircraft Corp., 126 10 Ave., So., Nashville, Tenn., Pres. & Ch. Engr.—L. E. Reisner; V. P. & Dir. Pub. Rel.—C. L. Riegel; Sls. Mgr.—W. Eddy; Pur. Agt.—J. M. Winchester; Maint. Engr.—J. Youngblood Contracts Mgr.—J. P. Jones; Plant Sup't.—R. Hackett

Timm Aircraft Corp., Metropolitan Airport, Van Nuys, Calif., Pres. & Ch. Engr.—O. W. Timm; V. P. & Gen. Mgr.—R. B. Buckley; Sls. Mgr.—L. Manion; Adv. Mgr.—W. C. Campbell; Pur. Agt.—J. W. Debrenan; Maint. Engr.—K. B. Steddom; Dir. Ind. Rel.—W. C. Drumm

United Helicopters, Inc., 1920 Addison St., Berkeley 4, Calif., Pres.—S. Hiller, Jr.; V. P.—R. L. Chamber; Dir. Pub. Rel.—F. Coffyn; Ch. Design Engr.—H Sigler

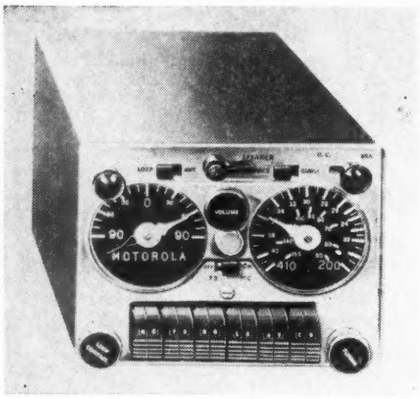
United Aircraft Corp., 400 S. Main St., East Hartford, Conn., Chmn.—F. B. Rentschler; Vice Chmns.,—E. E. Wilson & R. Walsh; Finance Chmn.—F. McCarthy; Pres.—H. M. Horner; V. Ps., C. J. McCarthy & S. A. Stewart; Ass't. to Chmn. L. D. Lyman; Ass't. to Pres.—H. E. Mooberry; Dir. Adv. & Publ.—N. V. Clements

Vought Aircraft, Chance Div. of United Aircraft Corp., Stratford, Conn., Gen. Mgr.—R. B. Beisel; Ass't. to Gen. Mgr.—J. D. P. Hodapp; Engr. Mgr.—P. S. Baker; Ch. Engr.—J. M. Shoemaker; Fact'y. Mgr.—B. D. Taliaferro; Sls. Mgr.—J. J. Hospers; Plant Engr. & Ass't. to Gen. Mgr.—W. H. Espey; Pur. Mgr.—G. Reid; Per. Sup.—G. V. Anderson; Pub. Rep.—F. J. Delear; Serv. Mgr.—W. H. McCarthy

AVIATION'S SHOWPLACE OF

Motorola Navigator 2-Way Radio

Single self-contained transmitter and receiver, Motorola Navigator, is stated by the maker, to have many new features among which are: Beam reception by push button, system by which call letters may be reset on push buttons by rotating disks at bottom of panel, 75



meg. marker reception, beacon, broadcast, and marker band reception, reception of both fan and "Z" markers concurrently with reception of other signals, 25-30 mi. range transmitter, and interphone communication while receiving signals. Set is made by *Galvin Mfg. Corp.,* Chicago 51, Ill.

Lear PX'er 2-Way Radio

New compact 2-way radio for lightplanes is specially designed to facilitate cross country flying. It is fitted with simultaneous range filter and built-in provisions for aural-null direction finding. In addition its current consumption of 4.5 amp. for receiver and transmitter and 6 amp. during standby operation is a very light drain on the plane's battery.

Transmission is on 3105 kc. and reception is on all ranges between 195 and 405 kc. The panel is free from microphone and headphone jacks, eliminating cords from the instrument board. Simultaneous range filter permits listening to voice broadcasts without interference from range signals. Another feature is the interphone with which pilot and passenger can communicate. Set is built by *Lear, Inc.,* Grand Rapids, Mich.

Bendix VHF Aircraft Transmitter

Flightweight transmitters are designed to permit the private flying to call either a control tower or ground station on the VHF channels instead of using the crowded low frequencies. These transmitters conform with the proposed program of CAA Federal Airways Service, calling control towers on 131.9 megs. and CAA Airway ground stations on 131.7 megs. Range is stated to be 50 mi. at 1,500 ft., with a greater distance at higher altitudes. A short 26 in. antenna is specified.

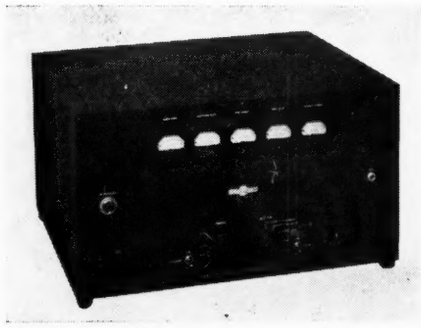
Also in Flightweight line of radio

accessories is a low-frequency range and broadcast receiver combining vibrator power supply, receiver, range filter, and loop directional facilities with a minimum of weight. Built by *Bendix Radio,* Baltimore, Md.

This firm also manufactures a 360-deg., azimuth dial-equipped directional loop.

Collins 32RA Transmitter

This 32RA transmitter is a compact, low-powered unit suited for radio communications either by telephone or telegraph. Completely self-contained, it gives four frequencies by use of a special gang switch. This switch selects the crystal, the pre-tuned tank circuits for the intermediate amplifier, and the output circuit for the desired frequency.

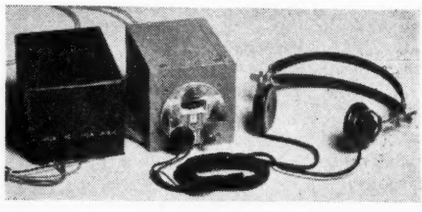


In the basic circuit, the oscillator stage is followed by an intermediate or frequency multiplier stage. Final amplifier uses three tubes, while four other tubes serve as modulators. Individual antennas may be used in connection with the gang switch, though it is quite practical to use a single antenna for the entire group of frequencies.

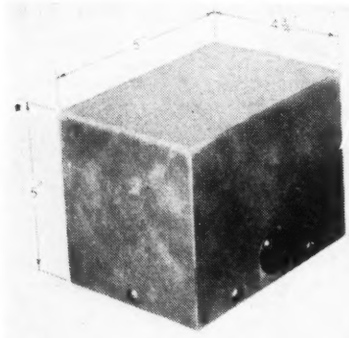
Power components are designed for continuous duty. First rectifier furnishes plate voltage to speech amplifier and bias voltage for power amplifier. Second rectifier supplies plate voltage to power amplifier and modulators. Panel controls are simplified to permit operation by non-technical personnel. Mechanical structure permits removal of all sections by loosening mounting screws, thus simplifying maintenance and servicing. Manufactured by *Collins Radio Co.,* Cedar Rapids, Iowa.

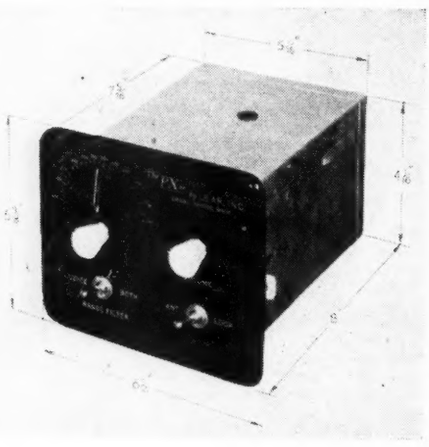
RCA AVR-101A Radio Receiver

A complete, battery operated receiver with beacon, broadcast, and traffic control selected by a single switch is stated by maker, *Radio Corp. of America,* Camden, N. J., to be smallest now pro-



duced, being only 4-in. square. Sensitivity is said to be equal to average commercial airline performance. Ignition shielding is not required when beacon antenna is used but installation of shielded lead-in cable is recommended. Midget tubes are used.





ACCESSORIES & FIELD UNITS

Three New Hallicrafters Radios

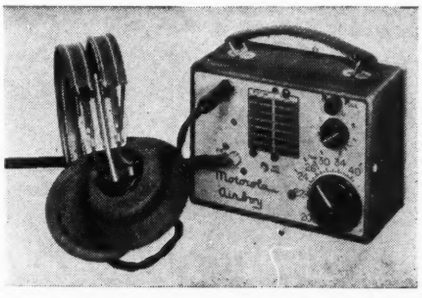
Three new models of Skyphone aircraft radio are announced. First is model CA-2, a 5-tube superheterodyne receiver with 10-12w. receiver operating from the airplane's standard 12v. system. Receiver has two frequency ranges, 200 and 400 kc. aircraft band, in addition to standard broadcast frequency. A 7-position switch permits selection of either band and also transfers receiver from regular antenna to direction-finding loop and places voice-range filter in operation, automatically tuning to airport tower frequency without change of dial setting. Transmitter uses two additional tubes, crystal amplifier and RF amplifier, the final receiver audio stage serving as modulator for the transmitter. This set uses no relays, all switching being done electronically upon pressing a push-to-talk button. Normal transmission is on 3105 kc., but 6210 kc. may be used by fitting a dual antenna.

Other unit will be model CA-1 aircraft receiver, similar to model CA-2, but using miniature tubes and dry batteries, thus being usable on planes not equipped with an electrical system.

Third model is CA-3 radiophone transmitter designed to operate under same conditions as CA-1 receiver and having the similar features. Maker is *Hallicrafters Co.*, 2611 Indiana Ave., Chicago 16, Ill.

Motorola Airboy Aircraft Receiver

Another set by Galvin Mfg. Corp. is Airboy, a portable battery-operated receiver with approximately 100 mi. range.



Though fitted with integral shielded antenna for use as a portable radio, the typical aircraft antenna may be used while in flight.

Aireon 50-Watt Ground Radio Station

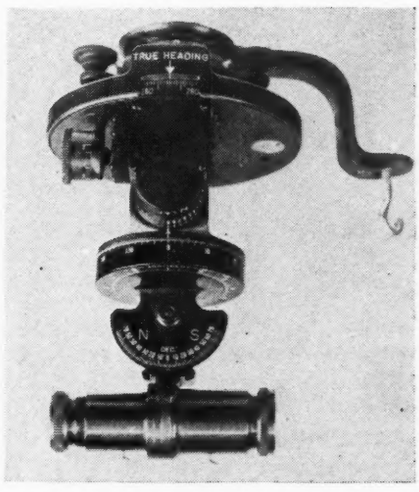
Control tower communications system features complete 50w. ground radio station ready for installation, with exception of antenna. Telephone frequency ranges are from 2.0 to 8.0 megs. Channels for operation from 200 to 410 kc. and 118 to 132 meg. are also available. Pre-tuned and crystal-controlled channels are selected merely by pressing push buttons.

Station may be used for either point-to-point or ground-to-plane operation and may be operated by third class personnel. All tuning adjustments and components are covered by locked door. Design is such that all equipment may either be in same room with operator, or transmitter or receiver may be remotely controlled. If remote control is used, separate telephone wires must be installed for transmitter and receiver. Transmitter control enables operator to control a.c. power input, selection of channel, and carrier control by means of microphone or push-to-talk foot switch. Receiver control permits operator to control a.c. power to both receivers in parallel, to select output of either receiver into telephone line, select high or low R-F sensitivity, and control the audio gain. Built by *Aireon Mfg. Corp.*, Kansas City, Kan.

Millar Celestial Compass

Developed to eliminate all computations during observation of sun, moon, or planets, and with only a simple addition necessary when taking star shots, this instrument is mounted in astradome to provide greatest practicable visibility. True heading indicator is adjustable so that instrument may be easily aligned with longitudinal axis of aircraft. Sighting unit is small telescope with crosslines treated with radium for night use, and fitted is Polaroid screen for making sun observations.

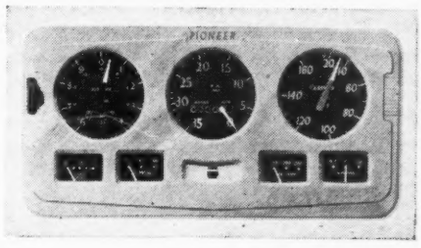
By use of a combination of easily-read scales, computation time is avoided, while maintenance is practically nil, through solid construction.



Instrument can also be used for checking or swinging compasses before takeoff. Manufactured by *Millar Instrument Co.*, Newark, N. J.

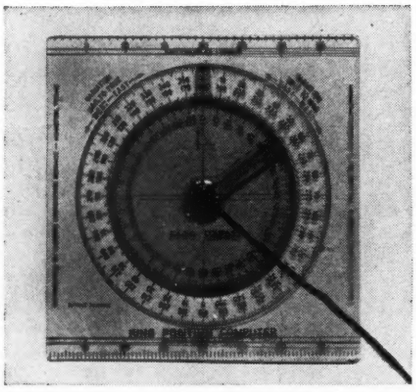
Bendix Lightplane Instrument Panel

This self-contained unit comprises basic instruments necessary for air travel at speeds and altitudes common with lightplanes. Three dials are: Altitude, tach with center hours record, and airspeed. On lower row are: Fuel, oil pressure, bank and turn, oil temperature, and ammeter. At extreme left is knob for setting altimeter to current barometer reading. Additional instruments, such a gyro horizon, rate of climb, clock, and manifold pressure gage, can be fitted in a larger panel of similar design. Manufacturer is *Eclipse-Pioneer Div. of Bendix Aviation Corp.*, Teterboro, N. J.



King Position Computer

The King Computer is an instrument designed to compute and plot radio compass bearings to determine geographical position of an airplane. Device is stated to make all calculations incident to radio compass piloting. For cross-country flights, multiple station



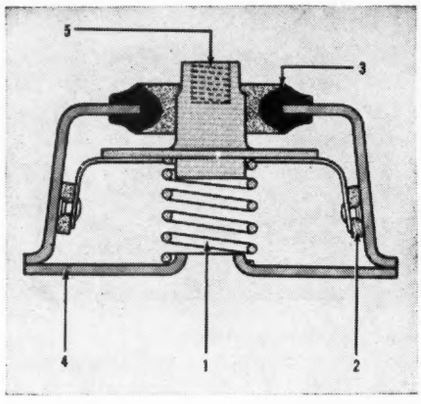
fixes can be computed instantly, so that position fix will have maximum accuracy when plotted. Maker states that virtually all directional problems arising during flight can be solved readily by means of this instrument in conjunction with a radio compass. Sold by *Carrow Navigation Service,* 2510 Oakdale Ave., Houston, 4 Tex.

Scott Aircraft Instruments

This assortment of instruments was designed particularly for type of lightplane which is not electrically equipped. Referring to numbers: (1) Is oil pressure gage, (2) free air thermometer, (3) ammeter, (4) top reading, gear action fuel gage, (5) side reading, gear action, fuel gage, (6) oil temperature gage, and (7) top reading, spiral float action, fuel gage. Manufacturer is *Scott Aviation Corp.,* Lancaster, N. Y. This firm also manufactures a complete line of hydraulic accessories.

Robinson Vibrashock Mounting

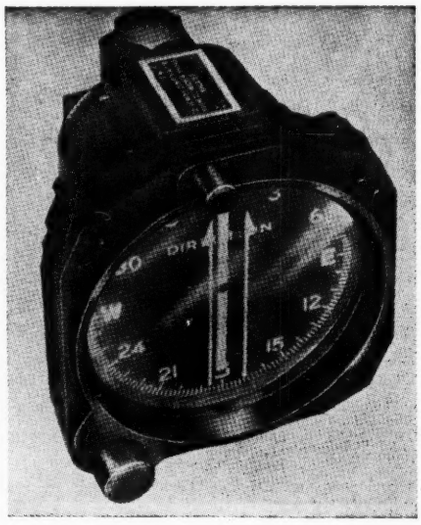
New mounting for protection of radio sets and other delicate units is equipped with stainless steel spring and rubber dampers. Cutaway view shows: (1) Load-bearing stainless steel spring, (2) damping device to kill low-frequency oscillation and minimize resonance, (3) 3-way rubber snubbers to limit heavy shocks, (4) housing, with attaching holes

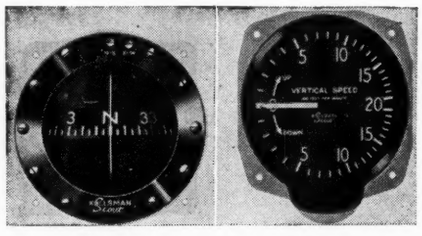


in base, and (5) load-carrying stud tapped for standard screw. Unit, built in capacities from ½ to 45 lb., is made by *Robinson Aviation,* Teterboro Air Terminal, Teterboro, N. J., developer of vibration-absorbing mounts for AAF and Navy radar and radio equipment.

Autoflight Direction Indicator

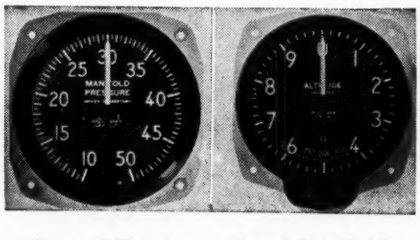
This magnetic compass, graduated in 2-deg. steps, has rotating pointer indicating heading of aircraft. Unlike conventional compass, pointer swings to side toward which plane is turning. Parallel to pointer are two adjustable reference lines for establishing course. Compass has low overswing, states maker, and jeweled bearings permit accurate operation even in power-off glides. Manufacturer is *G. M. Giannini & Co.,* Pasadena, Cal.



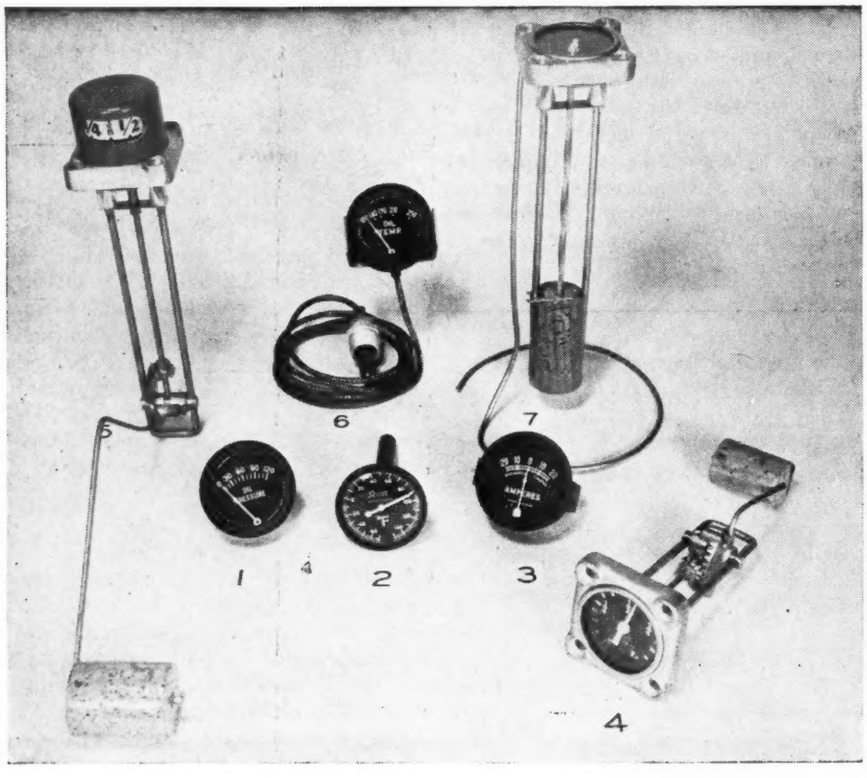


Kollsman Scout Compass **Scout Vertical Speed Indicator**

Specially developed in accordance with fact that high altitude and extremely low temperature requirements are not required for lightplane instruments, above compass and following four instruments, comprising "Scout" line, have been designed by *Kollsman Instrument Div. of Square D Co.,* 80-08 45th Ave., Elmhurst, L. I., N. Y. This firm also manufactures a standard line of high-altitude, low-temperature instruments for transport work which is already well known to all airlines and Service pilots.



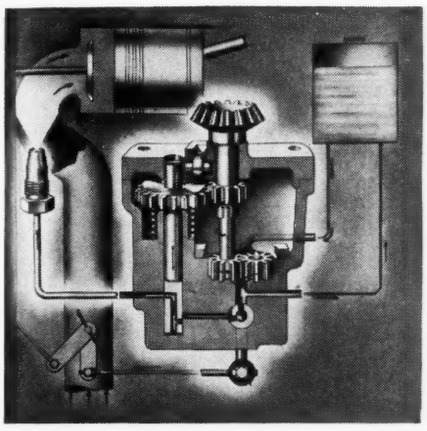
Scout Altimeter **Scout Manifold Pressure Gage**



Ex-Cello Fuel Injection System

Chief benefits claimed for this system over ordinary carburetor are elimination of icing and reduced head temperatures. Increased economy and engine life are also said to result.

Fuel is pumped and distributed to cylinders by reciprocating plunger pump (shown on left of pump body in diagram). Combination gear-and-cam at upper end of plunger both rotates plunger and gives endwise pumping motion. Rotary action distributes fuel to each cylinder in turn. Gear pump

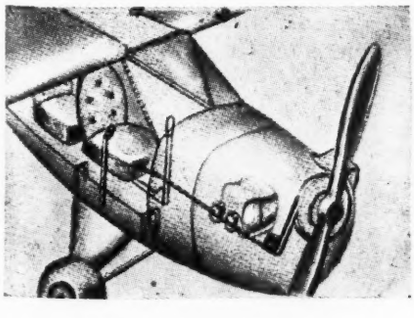


(right) provides constant fuel flow and pressure to metering valve, which takes place of usual throttle. Excess fuel returns to tank through port between gear pump and metering valve.

Because fuel pressure from gear pump is constant for any given engine speed, constriction of the delivery passage by metering valve has a measurable effect on flow to combined pump-distributor. An air throttle (left) is connected to metering valve actuating linkage, and it governs air volume when fuel flow is changed through rotation of metering valve. Manufactured by *Ex-Cello Corp.*, Detroit 6, Mich., this pump is at present built in 50-150 hp., 4-cyl., and 100-300 hp. 6-cyl. sizes.

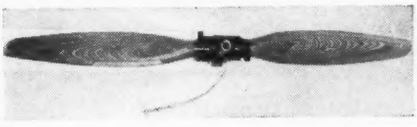
McDowell Lightweight Starter

New 12 lb. starter for lightplane engines has been approved by CAA, Army, and Navy. Used in combination with an impulse magneto—furnished on exchange basis—this device is stated to eliminate need for much electrical equipment. Operation is through hand-operated lever in cockpit. Complete with exchange impulse magneto, starter is made by *McDowell Mfg. Co.*, Pittsburgh.



CC&F Controllable-Pitch Propeller

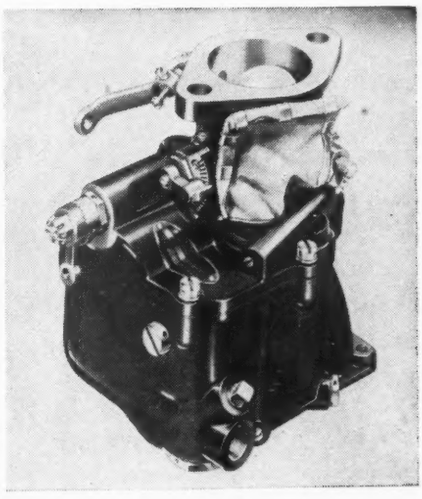
This two-position controllable propeller is made in sizes suitable for use with engines between 65 and 350 hp. Blades are of laminated wood, retained in steel ferrule with lagscrews. Pitch changing is handled by a hydraulic



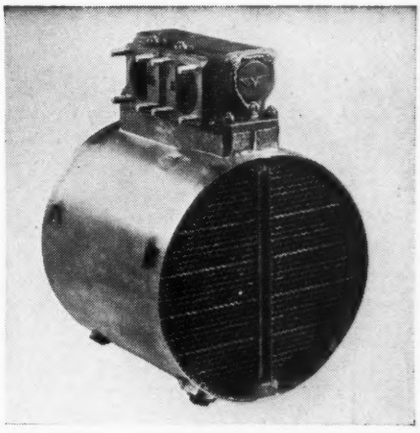
cylinder, coaxial with shaft. Cylinder is supplied with fluid under pressure from a vane pump in hub, driven by a gear meshing with another fastened to engine nose. Control is by flexible cable which, through gears, operates a hydraulic control valve in hub. Position of valve and flow of fluid are thus under pilots control at all times during flight. Propeller is manufactured by *Canadian Car & Foundry Co.*, Montreal.

Stromberg NA-R4B Carburetor

Having a barrel dia. of 2 1/16 in., this float-feed carburetor is suitable for en-



gines of about 150 hp. Of the single-barrel, updraft type, it has needle mixture control, metering needle economizer, separate pump discharge nozzle, and idle adjustment quadrant. An altitude metering jet hole is incorporated below the mixture control seat to prevent fuel being completely shut off when making lean adjustments at altitude.

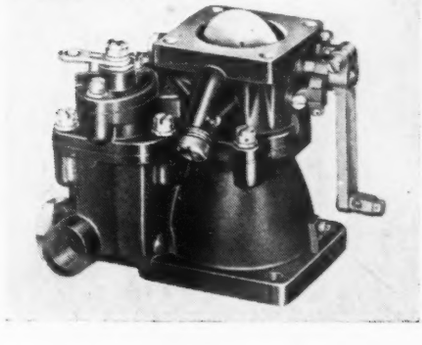


Young Oil Coolers And Temperature Regulators

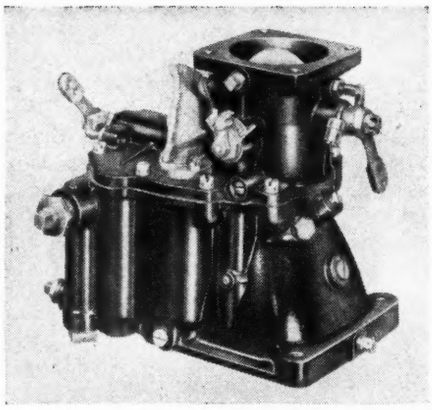
Developed for oil cooling on larger engines, these oil coolers are equipped with either external (top view) or internal (bottom view) temperature regulators. Temperature is controlled by controlling oil flow and by use of either automatic shutter or exit flap. Surge protection is provided to insure safety of radiator. All parts conform to Army-Navy standards. Available in a large range of sizes from *Young Radiator Co.*, Racine, Wis.

Stromberg NA-S3A1 Float-Feed Carburetor

This vertical, updraft, float-feed carburetor is designed for smaller power engines up to 120 hp. Main metering



jet is fixed-orifice type, thus no adjustment is required, except at high altitudes where mixture control may be used. Idle adjustment is provided to take care of slight variations in power plants. Fuel strainer, near fuel inlet, may be removed by taking out hex plug. Above and following model built by *Bendix Products Div.,* South Bend 20, Ind.



NA-R7A Float-Feed Carburetor

Designed for engines developing between 175 and 325 hp., this float-feed type carburetor has needle valve type economizer and mixture control. Carburetor is adapted for either gravity or pressure feed, only change being in fuel valve seat. Main and economizer metering jets are of fixed-orifice type so that no adjustment is required between cruising and full throttle.

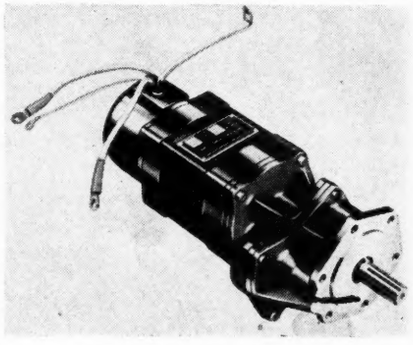
Hilco Flite Filter

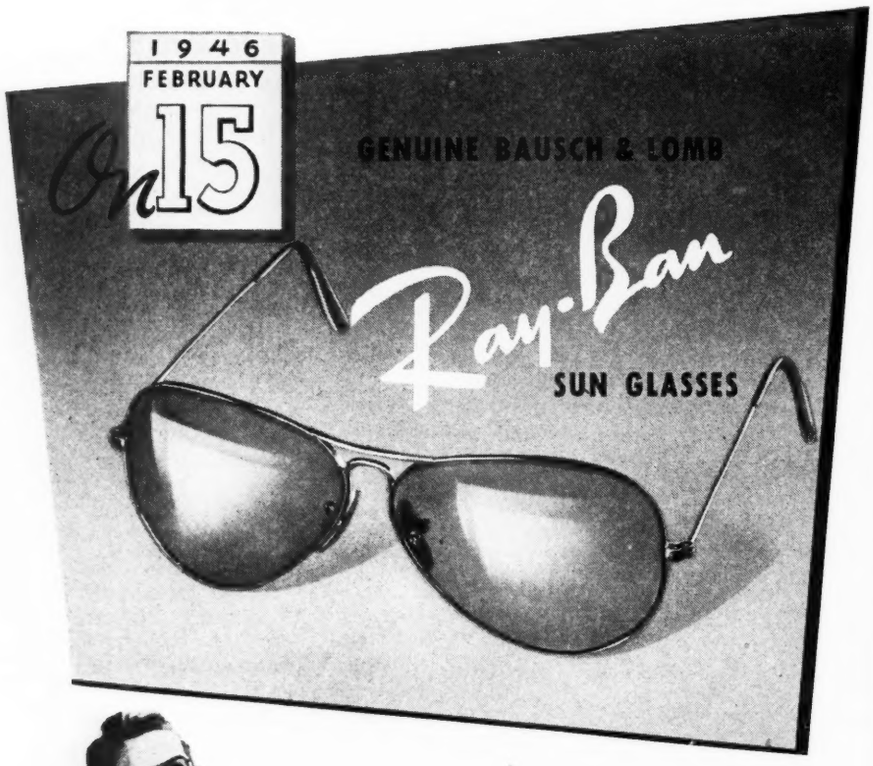
Designed for attachment to existing lubrications system of current engines, this filter weighs 15 lb. when completely filled with 1 gal. of oil. Dia. is 6 in. and height 16 in. Removal of top screw (without tools) permits instant changing of cellulose filter cartridge. Maker states

that filter removes carbon, sludge, dust, abrasives, and acid from lubricant. Device may be installed either on pressure side of system or in connection with scavenger pump. Manufacturer is *Hilliard Corp.,* Elmira, N. Y.

EEMCO Integral-Gear Starter-Generator

New starter-generator, for cranking and current generation, is produced for starting 4-cyl. engines to 125 hp. and 6-cyl. models of larger power. Torque limiting device prevents damage from backfire. Built with splined shaft for attachment directly to engine, this installation eliminates necessity for gear or chain drives. Rated at 500w., with voltages of 12, 24, or 32, starter-generator is made by *Electrical Engineering & Mfg. Corp.,* 4606 W. Jefferson Blvd., Los Angeles 21, Cal.





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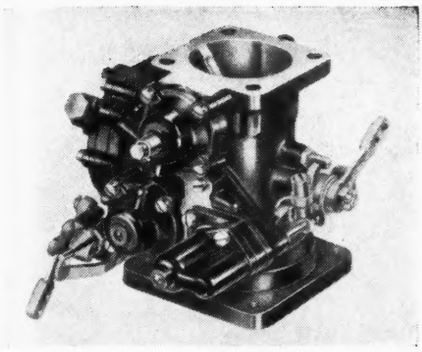
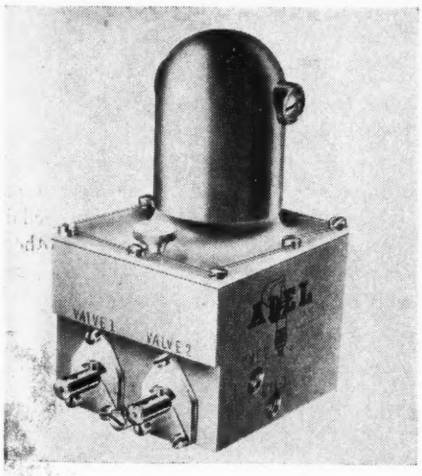


Stromberg PS5C Injection Carburetor

This injection carburetor is a single barrel, updraft unit having a closed fuel system from engine fuel pump to discharge nozzle. Carburetor incorporates regulated fuel discharge nozzle, mechanically-operated enrichment valve and manual mixture control, and idle cut-off mechanism. Also included is a vacuum-operated single-diaphragm accelerating pump. Pressure required on fuel is 9-11 psi.

Adel Dual Power Package

Designed as a complete hydraulic supply and control system for lightplanes, unit shown here contains an intermittent-duty electric motor, gear pump with 0.5 gpm. capacity at 300 psi., 30 cu. in. reservoir, two independent 4-way selector valves, check valves in



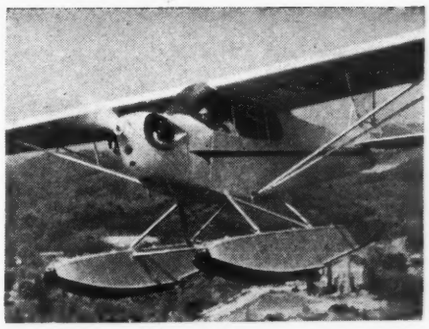
each line, and relief and by-pass valves adjustable to pressures between 250 and 400 psi. Weight is 5½ lb. dry. Routine checks are said to be sufficient for normal maintenance. Device is used for lightplane flap and landing gear operation, and control loads are light enough to permit levers of instrument panel type to be used. Made by *Adel Precision Products Corp.*, Burbank, Cal.

Plastic Manufacturers Panel Assemblies

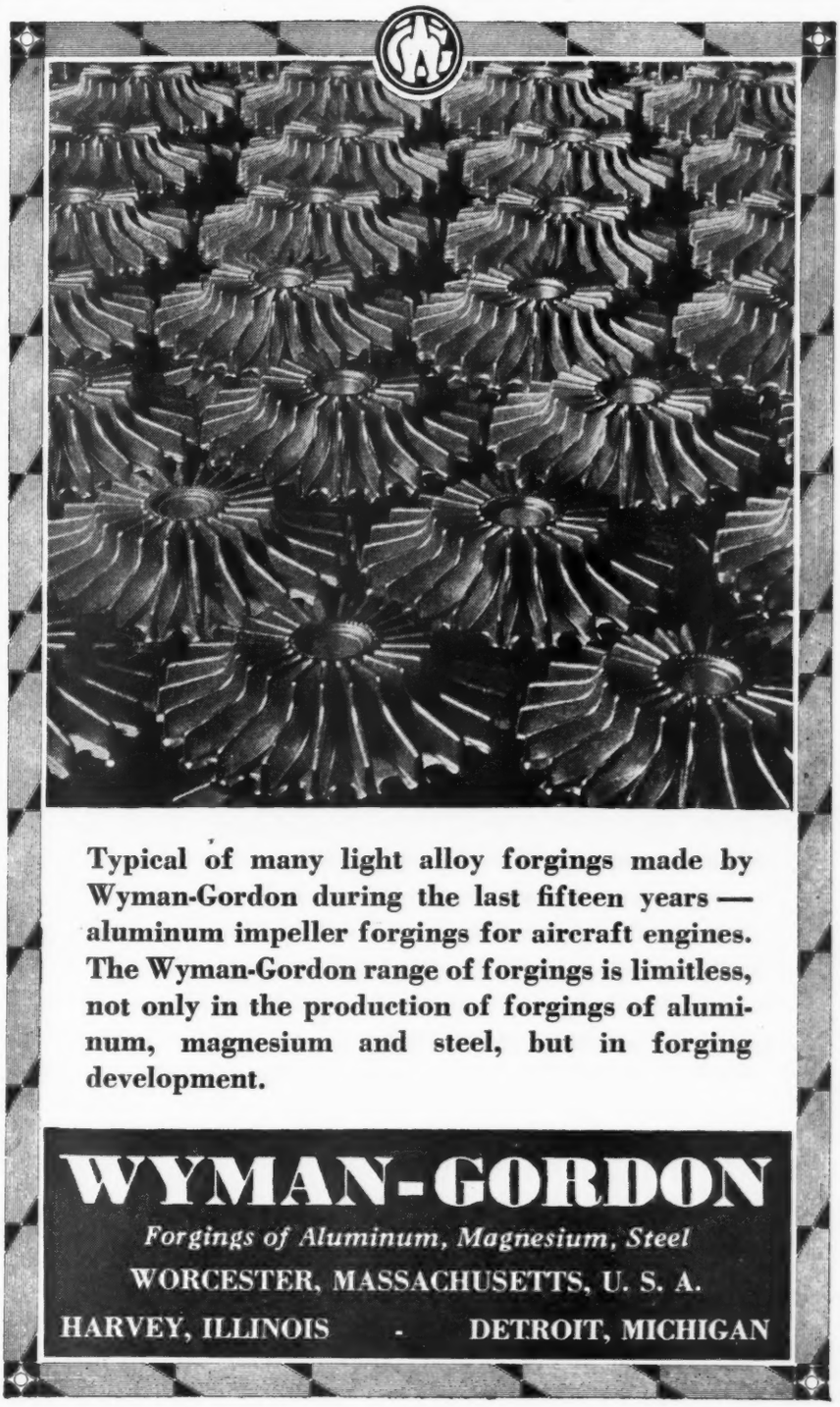
Made in continuous lengths of one-piece plastic construction, connector panel assemblies by *Plastic Manufacturers*, Stamford, Conn., conform to NAS 18 and NAS 17. Maker states that much assembly time may be saved by using these panels, which are delivered complete with hardware and cut to length, ready for installation without necessity for further operations.

Edo No. 1320 Light Seaplane Float

Seaplane floats of all metal construction and fitted with patented, retractable water rudder are now being made in 1,320 lb. capacity. These floats are CAA approved for most Aeronca Luscombe, Piper, and Taylorcraft models. Larger



sizes will be made in the near future. Manufacturer is *Edo Aircraft Corp.*, College Point, L. I. (Groenhoff photo.)


Typical of many light alloy forgings made by Wyman-Gordon during the last fifteen years — aluminum impeller forgings for aircraft engines. The Wyman-Gordon range of forgings is limitless, not only in the production of forgings of aluminum, magnesium and steel, but in forging development.
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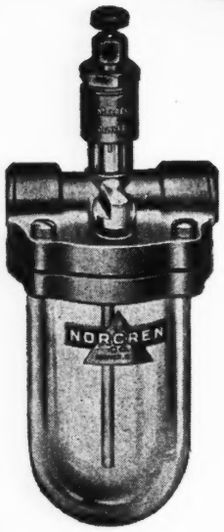

CORROSION INHIBITOR

Norgren Lubricators protect the vital working parts of all air driven tools and cylinders, and reduce the annual "cut" rust takes from your business. And how that helps get sweet performance!

Simple. Compact. Automatically injects just enough oil into the airstream to create an oil fog that travels with the air, maintaining a protective film of oil on every vital part.

Delivers only when the tool works—for "smooth as silk" performance—prevents rust from condensation when tool is idle. You need not turn it on; you can't forget to turn it off.

Norgren Lubricators quickly pay for themselves in reduced tool wear, oil saved, and less down time for repairs and replacements. A size for every purpose.

Write for catalog 400. C. A. Norgren Co., 220 Santa Fe Drive, Denver 9, Colorado.

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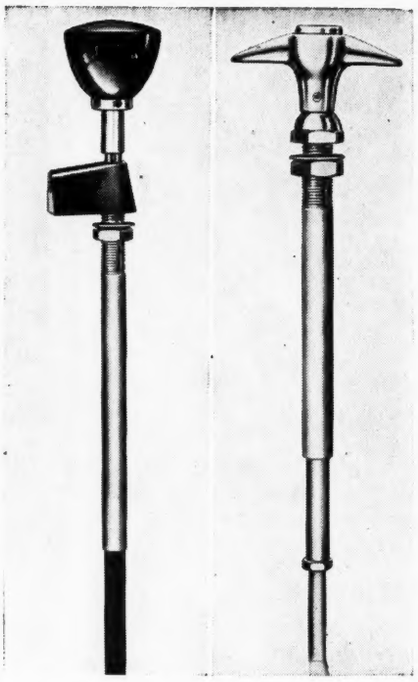

Arens Push-Pull Controls

Push-pull control (left) for throttle operation is fitted with CAA-approved 3/16 in. o.d. casing with flexible inner member, providing maximum strength. Adjustable friction is incorporated in faceplate, permitting permanent adjustment on installation. Tension lock control (right) may be used as a lock to hold high loads, such as parking brakes or heavily loaded shutters. Both the above and many similar accessories are made by *Arens Controls, Inc.,* 2253 S. Halstead St., Chicago, Ill.

Scott Foot-Operated Hydraulic Brake Actuator

Lightplane hydraulic brakes may be applied by means of foot pressure in place of power through use of new pedal and pressure cylinder. This and other three items by *Scott Aviation Corp.* are made at Lancaster, N. Y.

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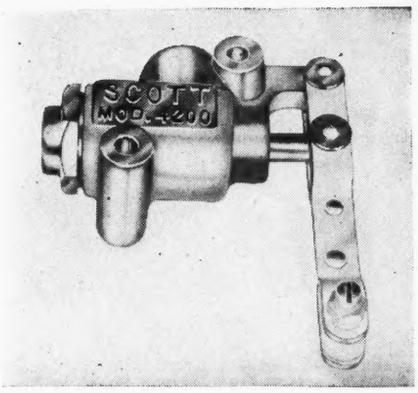
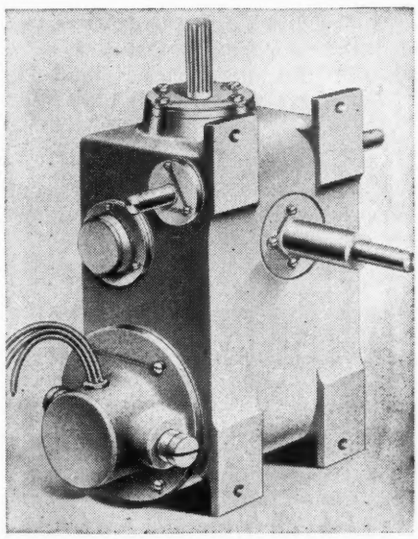


Scott Parking Brake Valve

Above parking brake locking valve is used both to connect parking brake cylinder with source of pressure and to lock brake in "On" position by preventing return flow of fluid to system's hydraulic reservoir.

Foote Power Unit

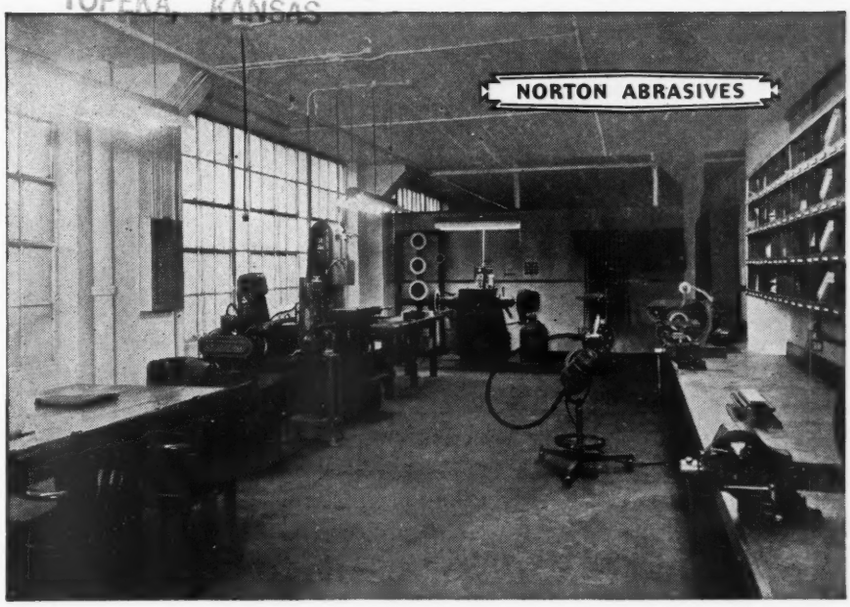
In this unit a built-in electric motor drives spur, bevel, and worm gears, which transmit power through three output shafts. These shafts drive Acme screws to operate the plane's landing



gear. A spring loading device prevents damage from extreme shocks and slows down the motor until overloading causes electric circuit to cut out. Designed to suit specific applications, unit is made by *Foote Bros. Gear & Machine Corp.*, 5225 South Western Blvd., Chicago 9.

Control Pulleys
By Plastic Manufacturers, Inc.

Made in sizes conforming to AN specifications AN-FF-P-796, these plastic control pulleys are designed for loads of 200,500, and 1,200-lb. Capacity of bearings without Brinelling balls is considerably higher than possible working load. Made by *Plastic Manufacturers, Inc.*, Stamford, Conn.



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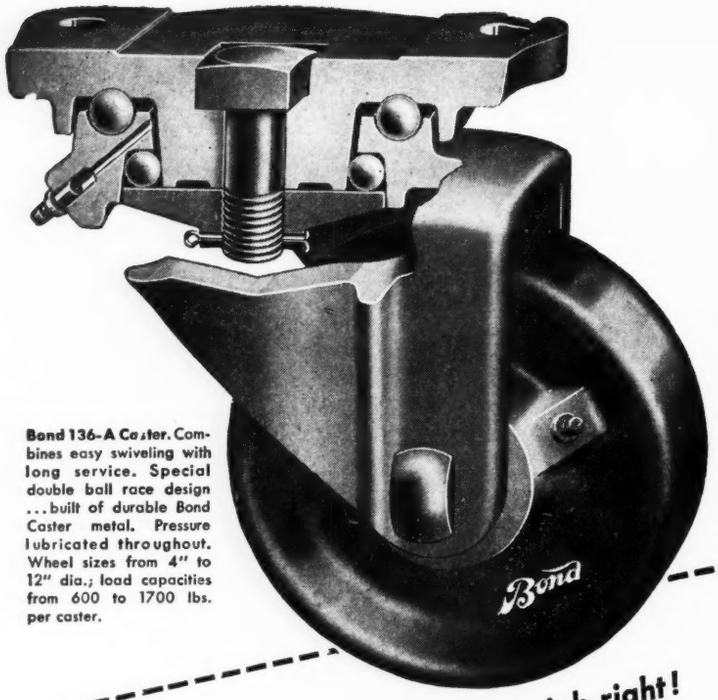

Bond 136-A Caster. Combines easy swiveling with long service. Special double ball race design ... built of durable Bond Caster metal. Pressure lubricated throughout. Wheel sizes from 4" to 12" dia.; load capacities from 600 to 1700 lbs. per caster.

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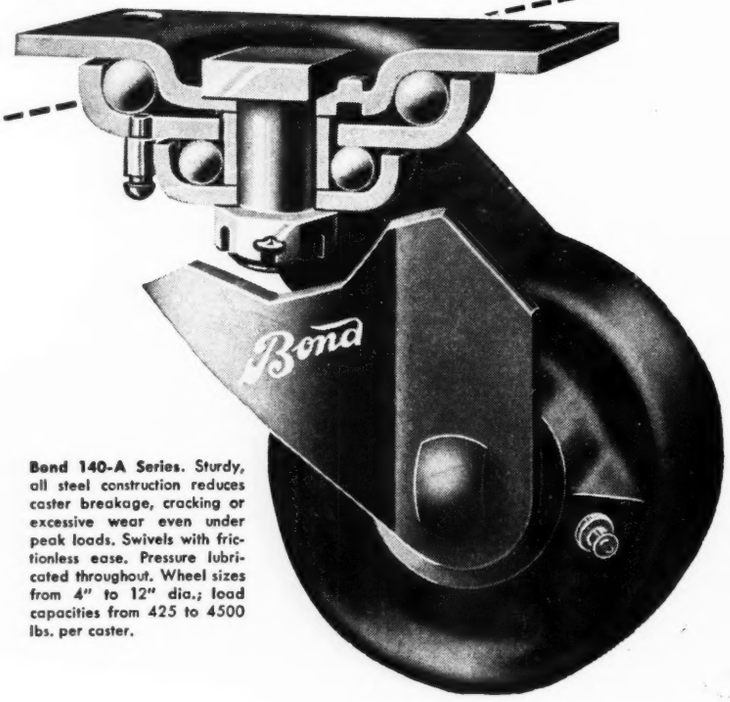
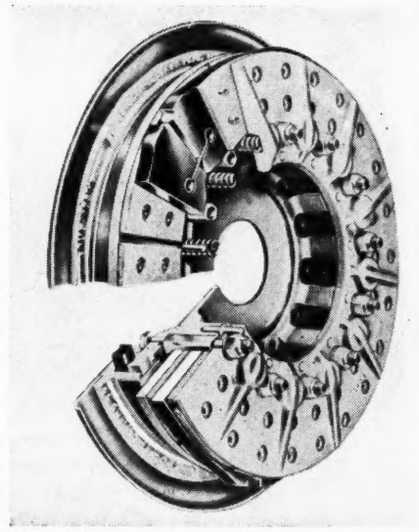
BOND FOUNDRY & MACHINE CO., MANHEIM, PA.



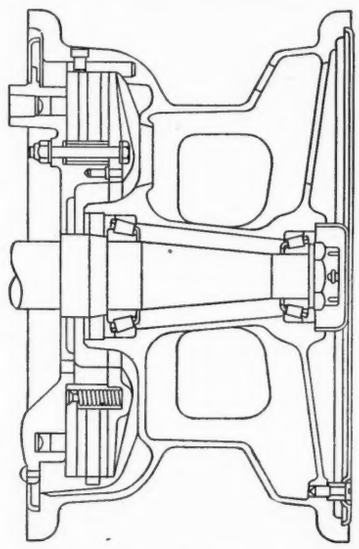
Bond 140-A Series. Sturdy, all steel construction reduces caster breakage, cracking or excessive wear even under peak loads. Swivels with frictionless ease. Pressure lubricated throughout. Wheel sizes from 4" to 12" dia.; load capacities from 425 to 4500 lbs. per caster.



Bendix Segmented-Rotor Brake

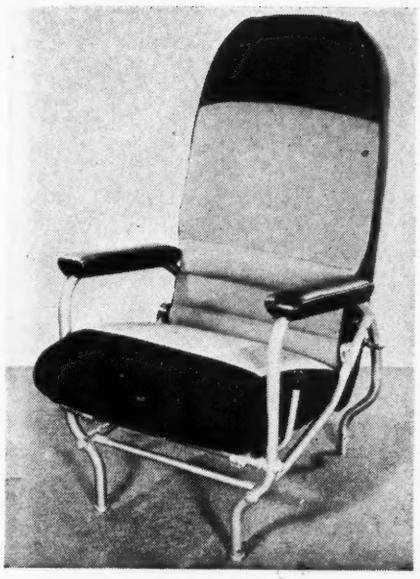
Comparatively thick metal segments are employed as rotating members in this brake, in order to carry away heat more effectively and provide self-alignment. Bendix developed the unit, which is stated to eliminate "fading" or decreased effectiveness after severe application.

Channels between segments are designed not only to permit better air circulation but also to provide space for escape of lining dust, thus increasing



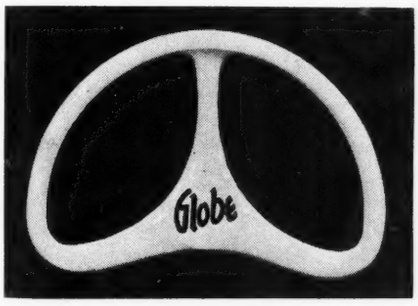
considerably the efficiency of braking effort. Brake is applied by means of an annular hydraulic chamber, latter being equipped with a piston ring and seal, which forces the parts into contact during brake application.

Self-aligning and non-warping characteristics of segmented friction lining are said to give maximum braking with minimum contact pressure, thus reducing the amount and pressure of hydraulic fluid required for a given application. The device, made by *Bendix Aviation Corp.*, South Bend, Ind., covers a range of sizes from 5 in. to 31 in. hub dia.



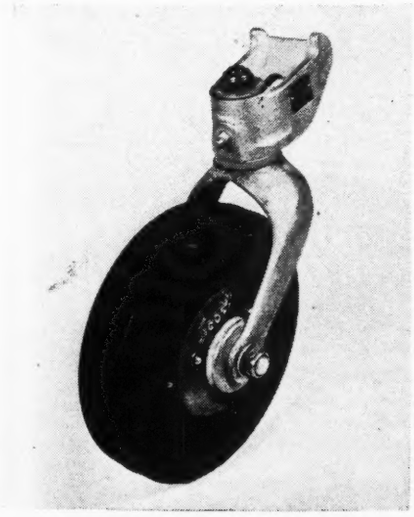
Warren McArthur Airplane Seat

New design, lightweight aircraft seat, built with tubular frame, is adjustable by means of lever at side. Model illustrated is used on Beech Aircraft. Maker is *Warren McArthur Corp.*, 1 Park Ave., N. Y.



Scott Metal Steering Wheel

Light metal, plastic-dipped aircraft steering wheel used on Globe Aircraft.



Scott Tailwheel for Lightplanes

Designed for use on any lightplane using leaf tailspring, this fitting carries 6 x 2 full-swiveling solid tailwheel.

Heat and Corrosion Resisting Equipment

The Pressed Steel Company has solved the problem for many airplane plants of obtaining equipment that will offer maximum resistance to heat and corrosion, and yet be easy to handle.

The facilities of our large plant are flexible for the rapid production of light-weight, welded alloy steel equipment.

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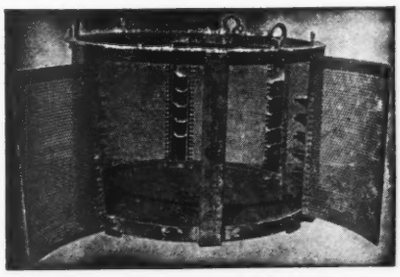
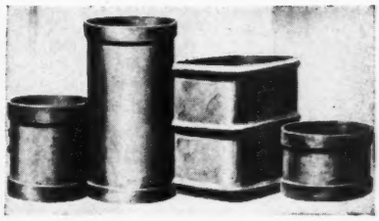


Annealing and Heat Treating Basket 6 ft. in diameter and 6 ft. high with adjustable shelves and sides.



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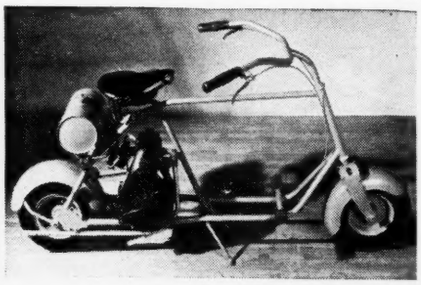
Link Sectional Sportsman's Canoe

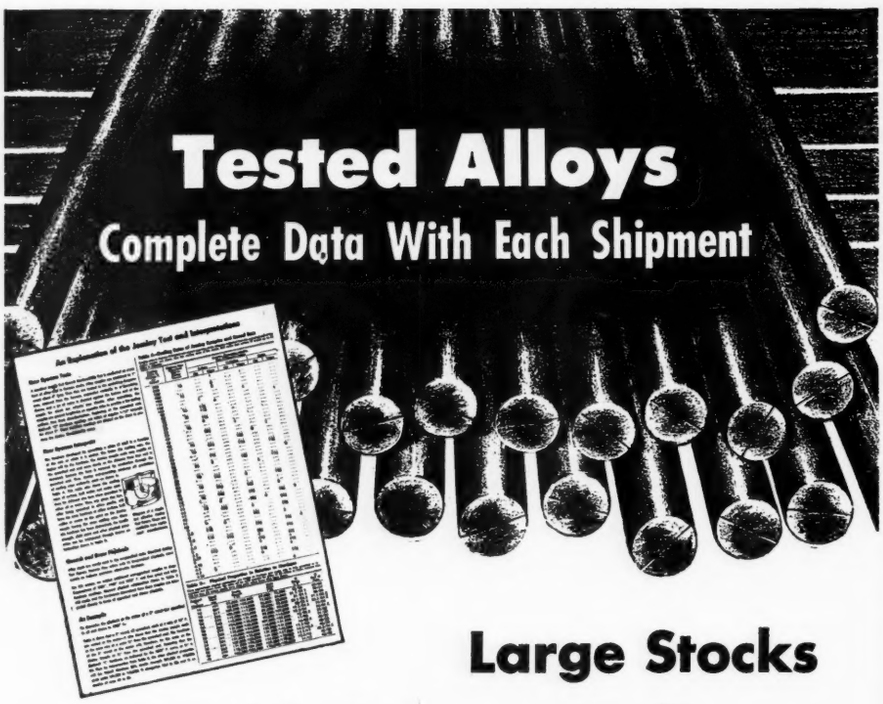
Designed for compact packaging and easy transportation by plane, this canoe was first built by inventor, Edwin A. Link, for his own use. Constructed of molded plastic sheet with bent hardwood frames and rustless fastenings, craft can be assembled in less than 10 min. without tools. Weight, including two suitcase-size carrying bags, is 64 lb. *Link Aviation Devices, Inc.*, Binghamton, N. Y., is manufacturer.

Interstate Scootercylce

Developed to provide transportation for itinerant flyers, where taxi or bus service from airport is not available,



this Scootercycle is stated by maker to be simple enough for successful operation without previous instruction. Weighing only 84 lb., it has centrifugal clutch which takes up drive as throttle (right handle) is opened to running speed. Only other control is brake (left handle) with sufficient size to stop engine if rider should inadvertently press both levers. Having only two controls and no foot pedals, machine is stated to require only a minimum of maintenance. Builder is *Interstate Manufacturers, Inc.*, 9253 Nicollet Ave., Minneapolis.



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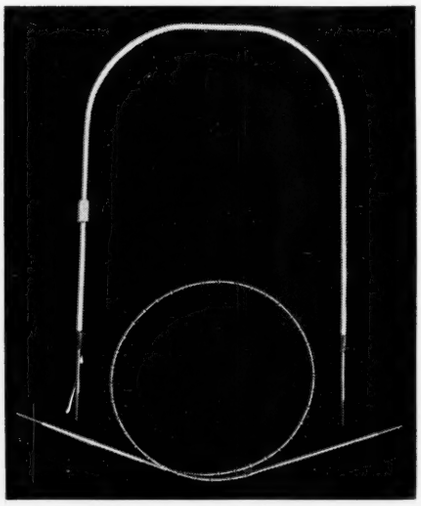

Simmonds Light-Duty Push-Pull Control

Feature of this control is linkage connecting collars which are a sliding fit in housing. Available in both rigid and

(*Continued on page* 198)

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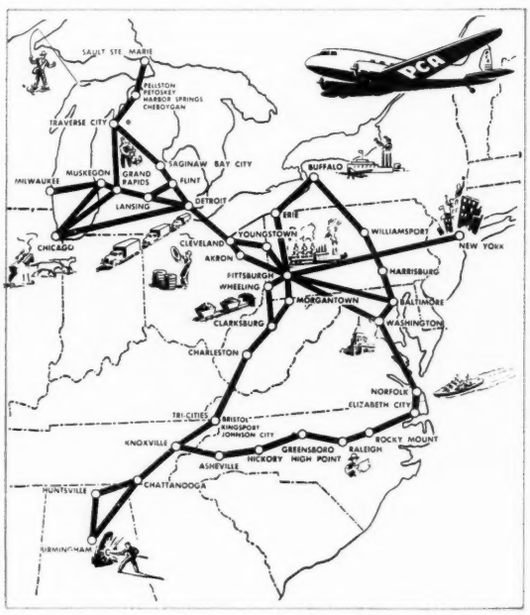

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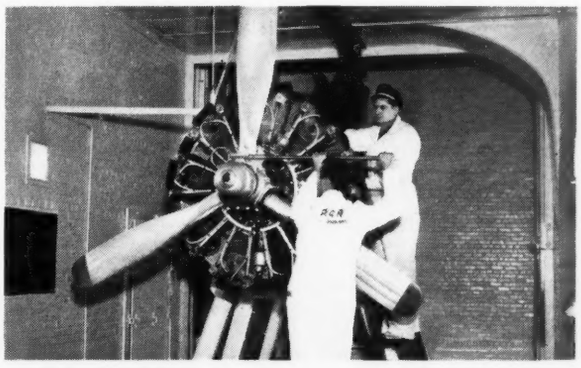
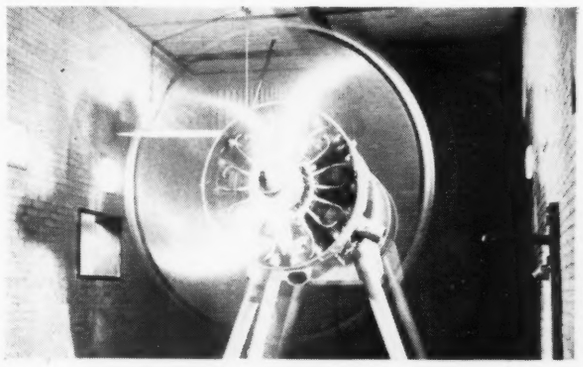
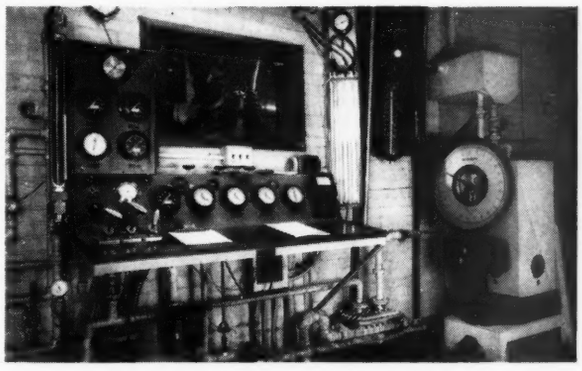
PCA "STEPS OUT" IN TECHNOLOGY, TOO



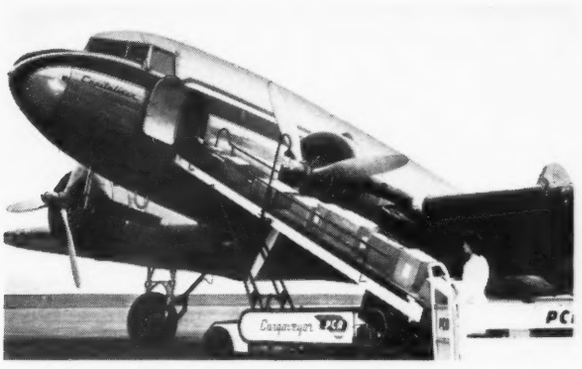
THE DYNAMIC ENGINE MOUNT developed by PCA tuning up for test cell run.



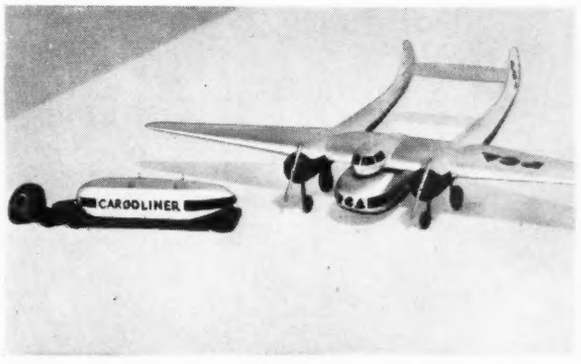
TEST under way during overhaul saves 16 man-hours per engine.



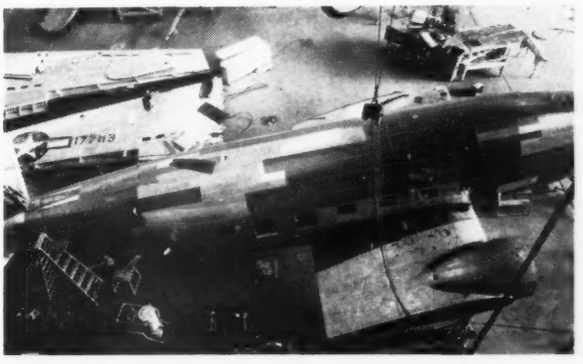
PCA TEST ENGINEERS keep meticulous records at this master control board.



THE CARGOVEYOR, electrically driven leveling device, was devised by PCA engineers.



PCA DESIGNED first cargo-type airplane with detachable fuselage.



PCA SET new 15-day record for reconverting from military to commercial service.

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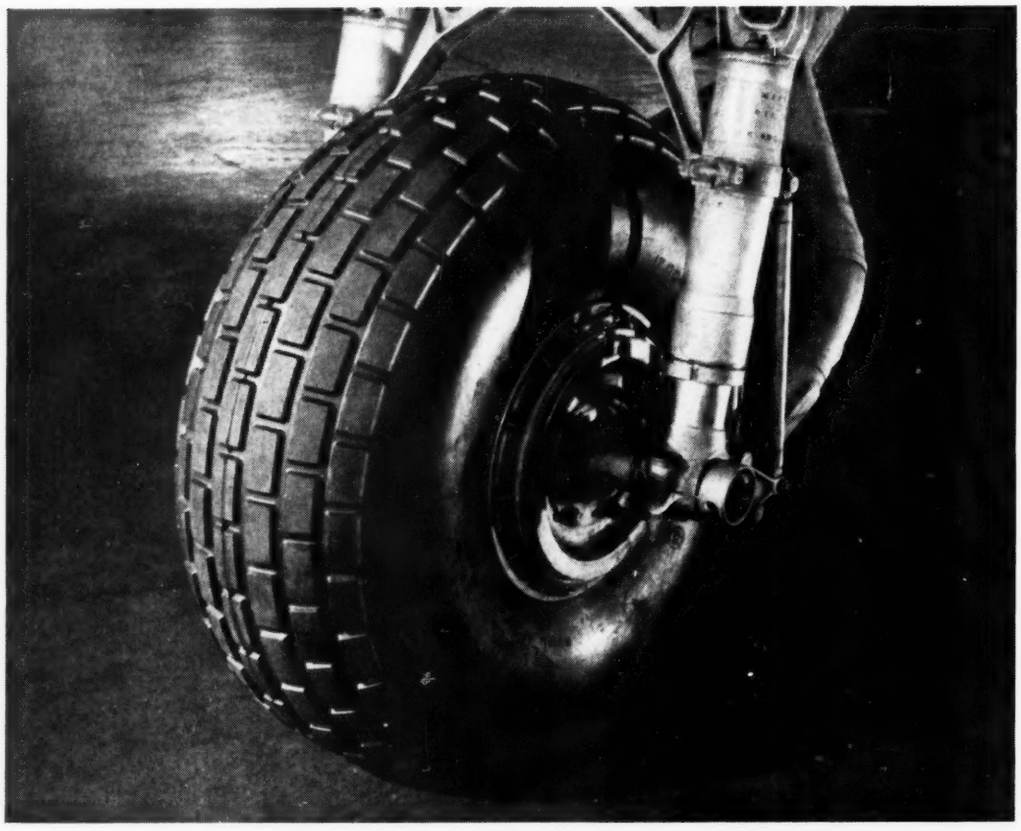

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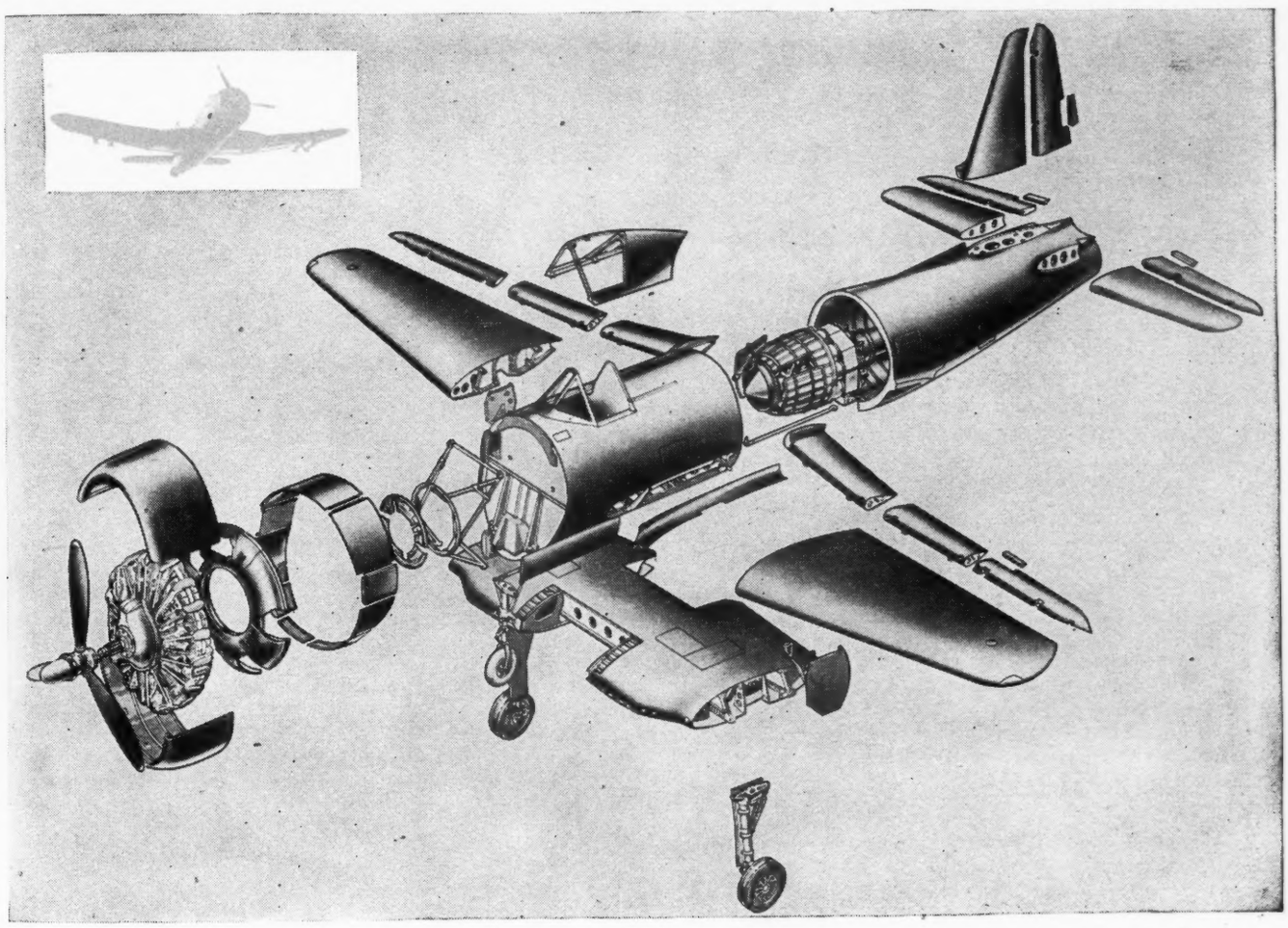
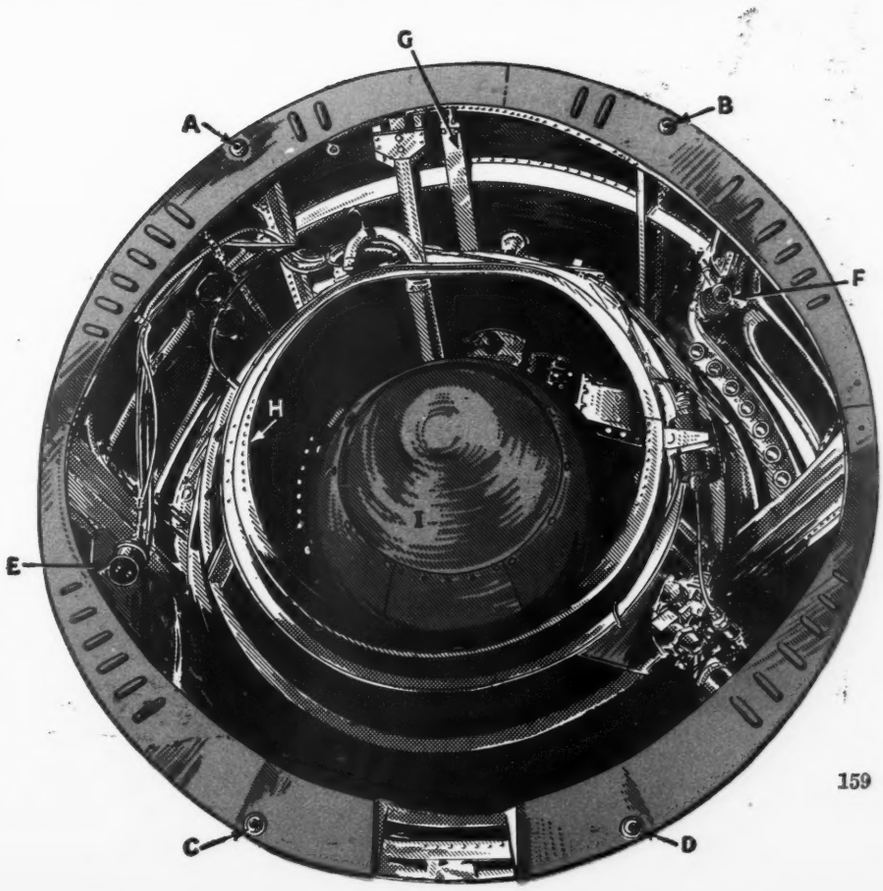
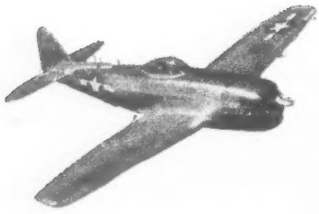
AVIATION'S SKETCHBOOK OF DESIGN DETAIL

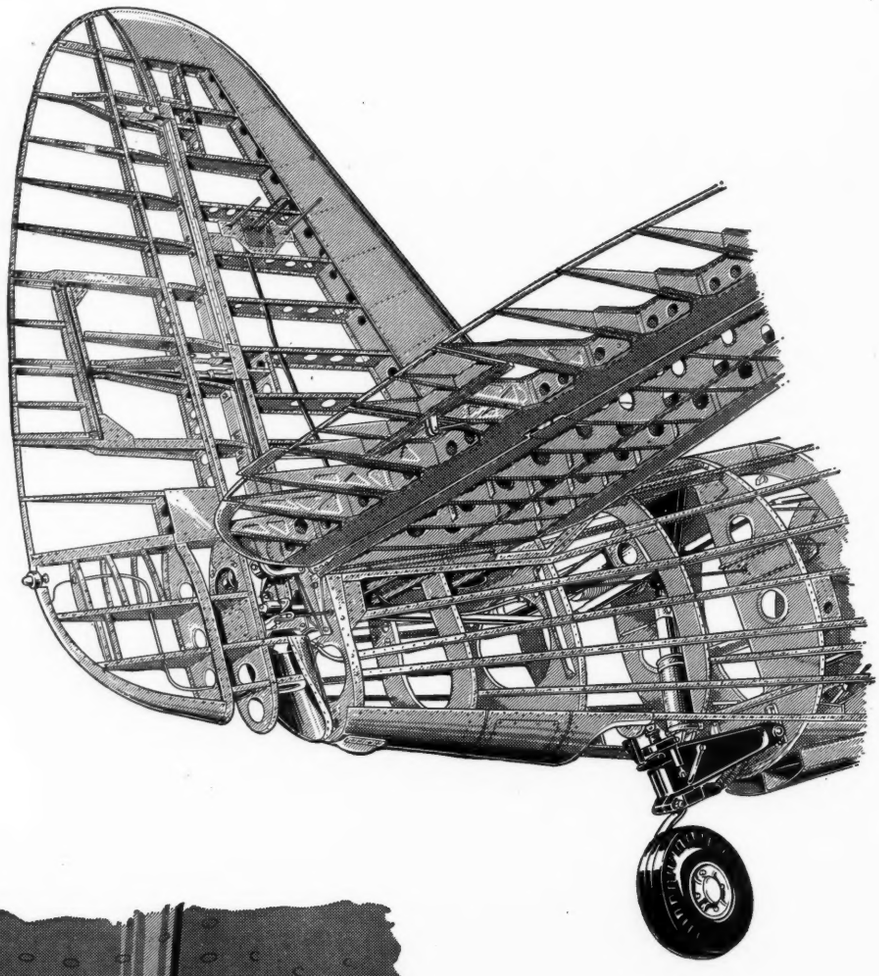


Exploded view showing major components of Ryan FR-1 Fireball, carrier-borne Navy fighter powered by combination of conventional Wright Cyclone engine and modified GE Type I-16 turbojet (latter is seen between mid and aft sections of fuselage). Turbojet is mounted in aft fuselage section, which can be quickly joined to mid-section, as shown in sketch at right.

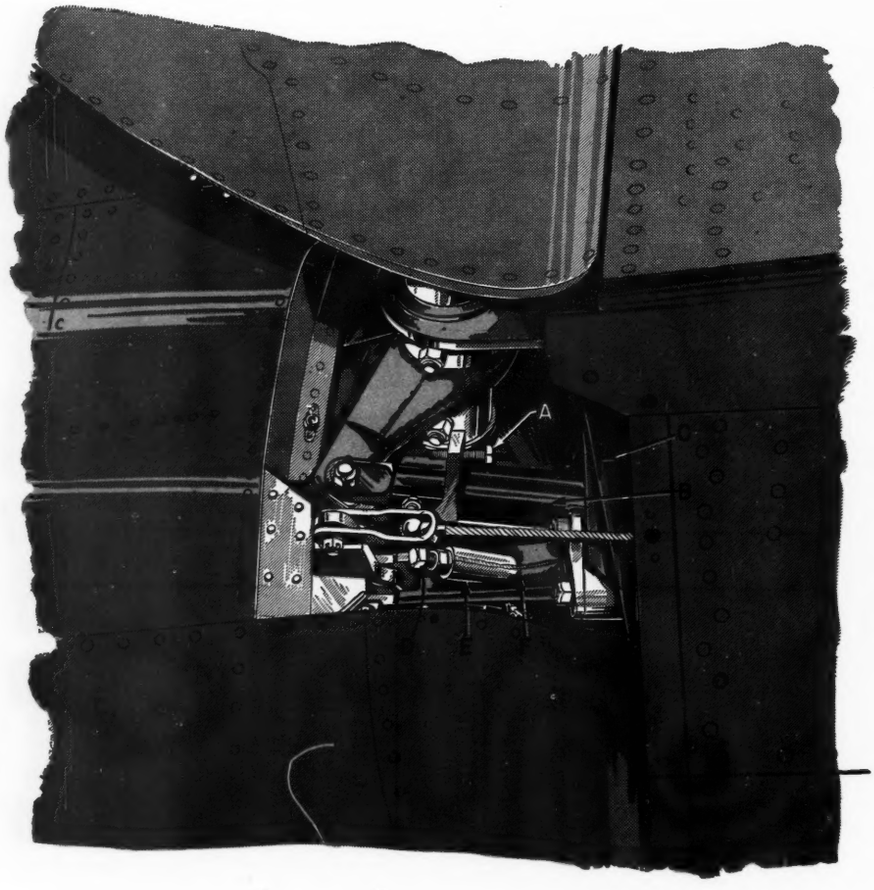


Head-on view of aft section of Fireball, where fuselage can be broken (just aft of wing trailing edge) to give access to General Electric I-16 turbojet engine. Fuselage is joined to fore section at points (A), (B), (C), and (D). Note quick-disconnect multiple electric connections (E) and (F). Monorail (G) serves as top engine pickup point, also facilitating engine removal. Ram air from ducts in wing leading edge enters duct (H) around fairing (I) which covers turbojet accessory case.

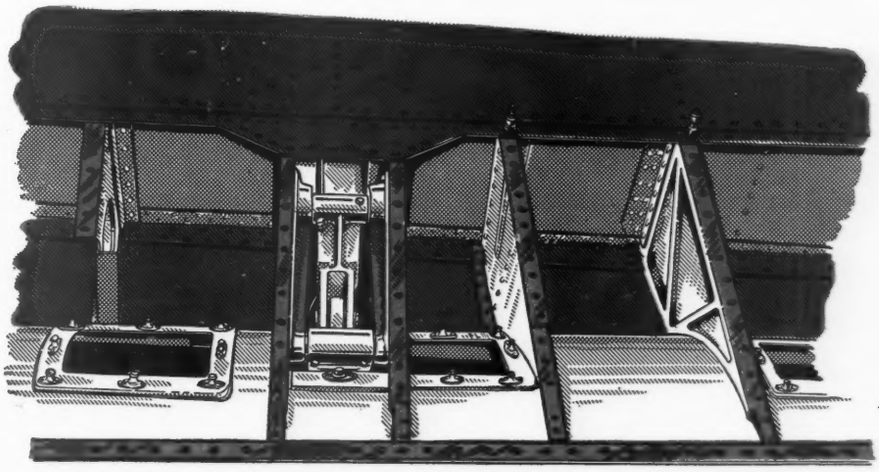




Skeletonized view of Republic P-47N Thunderbolt empennage, revealing structure of fin and rudder, stabilizer, and elevator, including aft fuselage showing installation of retractable tail wheel.

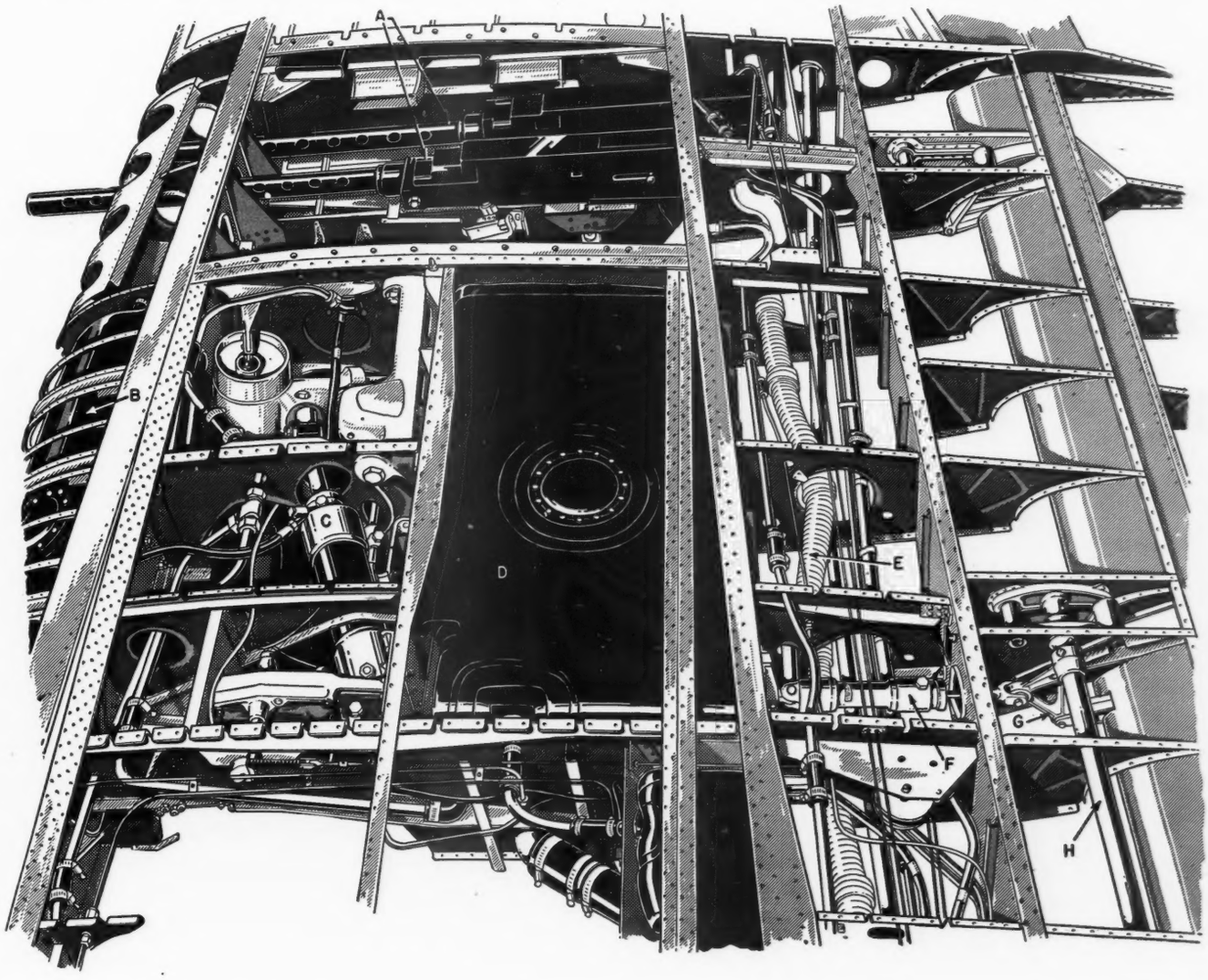


Adjustable stop nut (A) on P-47N elevator control is set in fitting attached to torque tube (B), limit being determined by distance from fitting (C). Rudder stop nut (D) is set in fitting (E) attached to rudder hinge bracket (F).

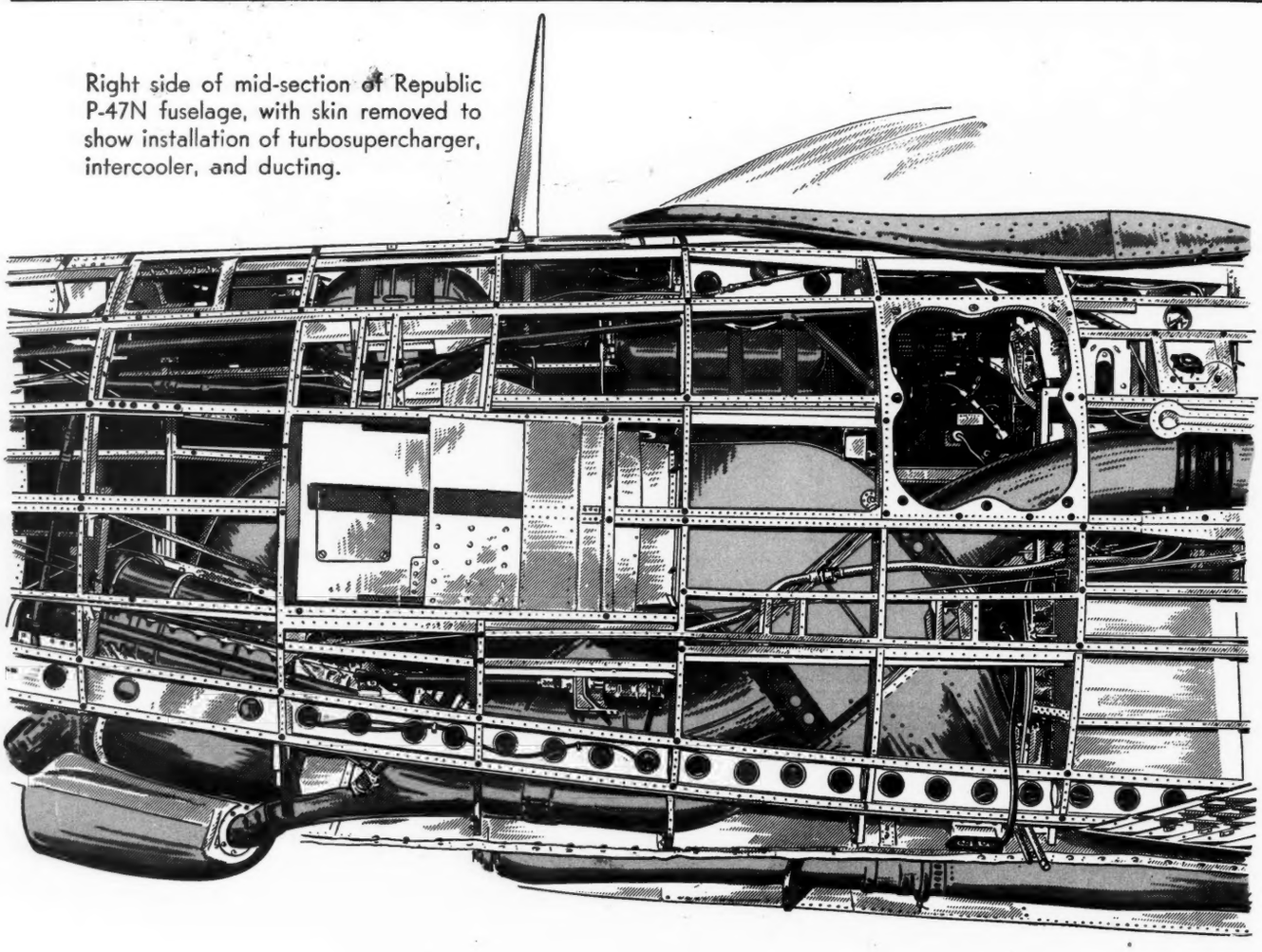


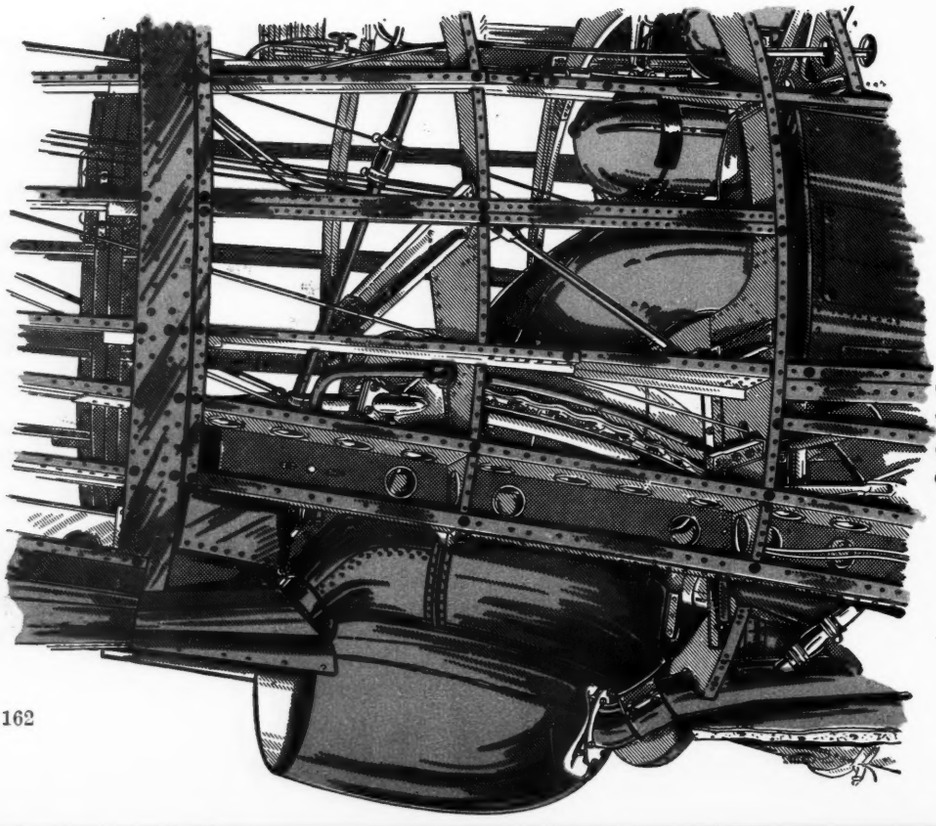
Detail of P-47N wing seen from aft of trailing edge, showing false spar and rib structure around flap-actuating bell crank. Quickly removable inspection panels are seen on either side.

Right wing of Thunderbolt with top skin removed to show (A) installation of two of four 50-cal. machine guns; (B) leading edge fuel tank; (C) hydraulic landing gear retracting cylinder; (D) 29-gal. self-sealing fuel tank; (E) gun heater tube; (F) hydraulic flap actuating cylinder; (G) flap actuating bell crank; and (H) torque tube.

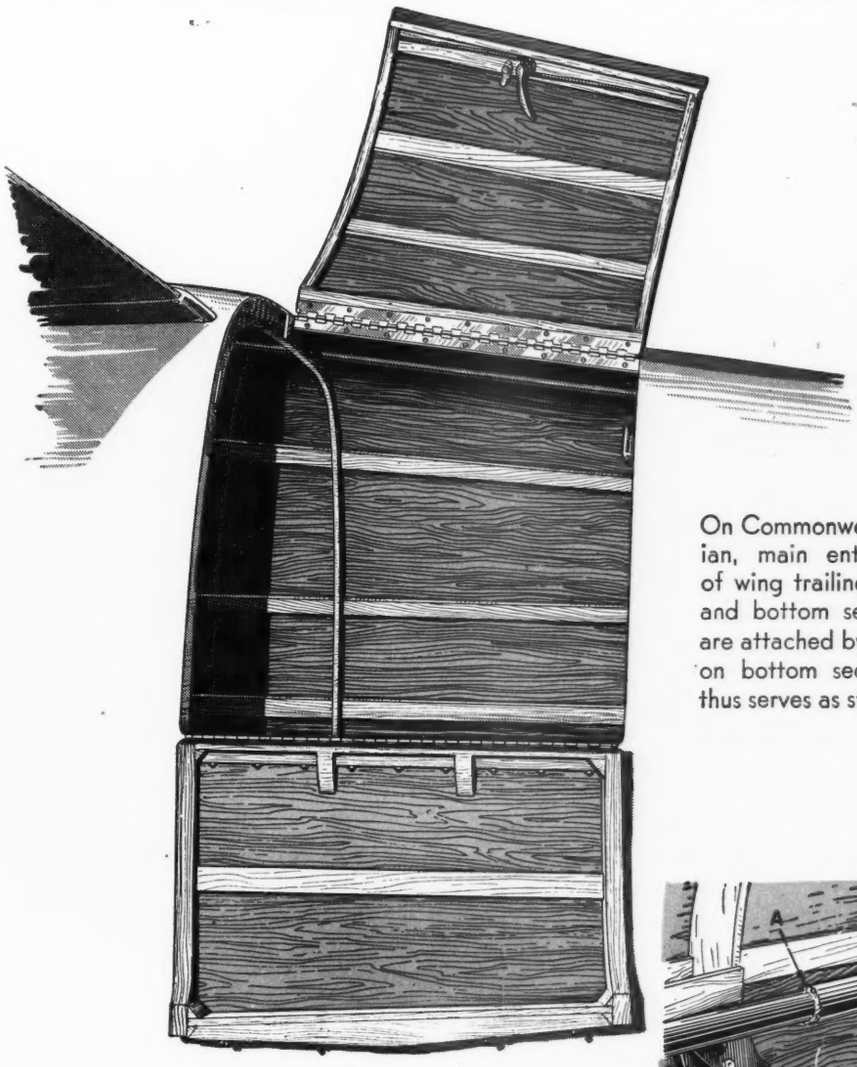


Right side of mid-section of Republic P-47N fuselage, with skin removed to show installation of turbosupercharger, intercooler, and ducting.

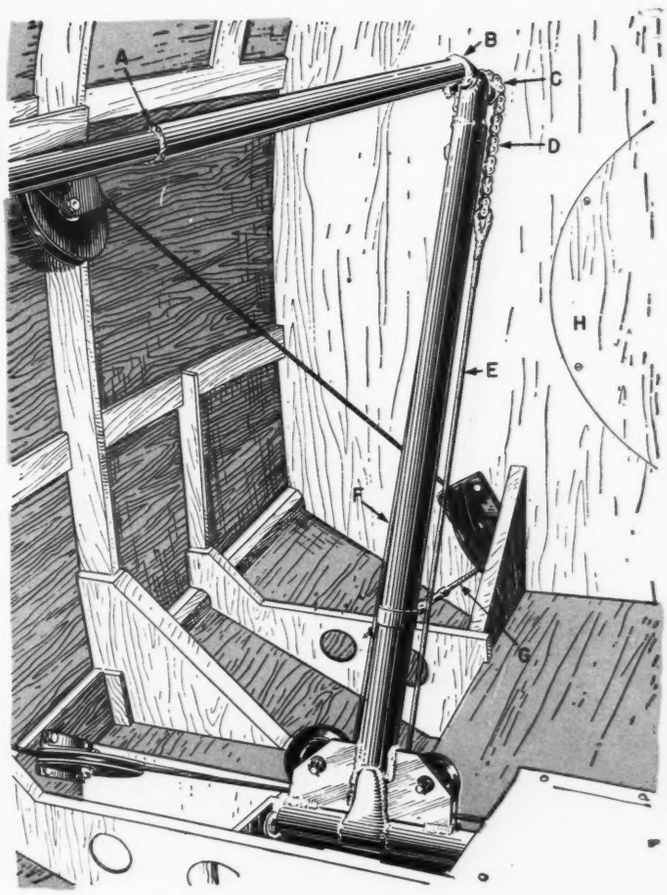




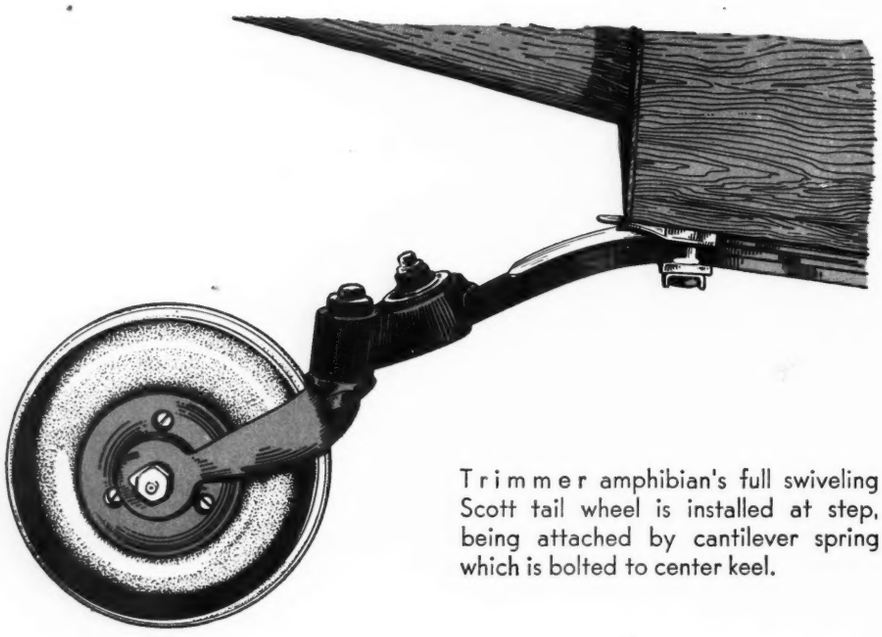
Closeup of right side of fuselage, with skin removed showing details of installation of turbosupercharger exhaust.



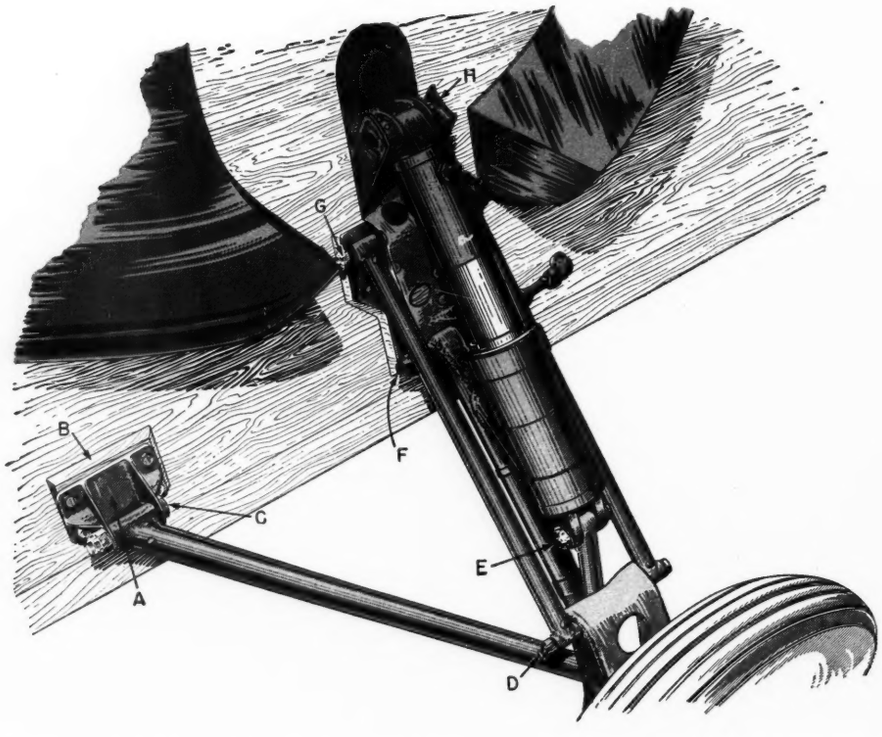
On Commonwealth Trimmer Amphibian, main entrance hatch just aft of wing trailing edge, is built in top and bottom sections, both of which are attached by piano hinges. Ledge on bottom section has 4-in. depth, thus serves as step.



Looking forward just below instrument panel of Trimmer, showing hull construction and control column. Torque tube (A), connected to control wheel, operates through universal joint (B) to turn sprocket (C) and drive chain (D) which is attached to cables (E) and (F) leading to ailerons. Cable (G) leads from column through pulleys to elevators. Covering (H) is in watertight bulkhead dividing hull nose from passenger cabin.

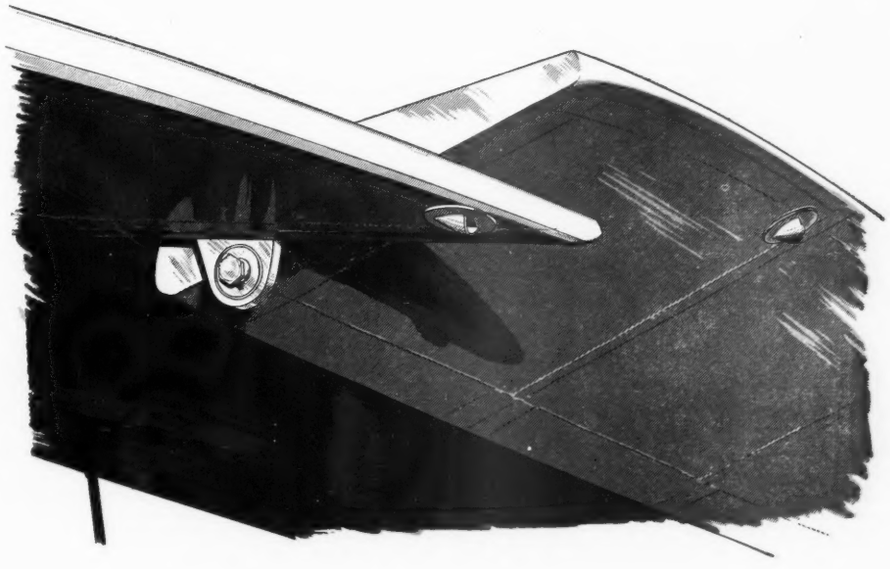


Trimmer amphibian's full swiveling Scott tail wheel is installed at step, being attached by cantilever spring which is bolted to center keel.



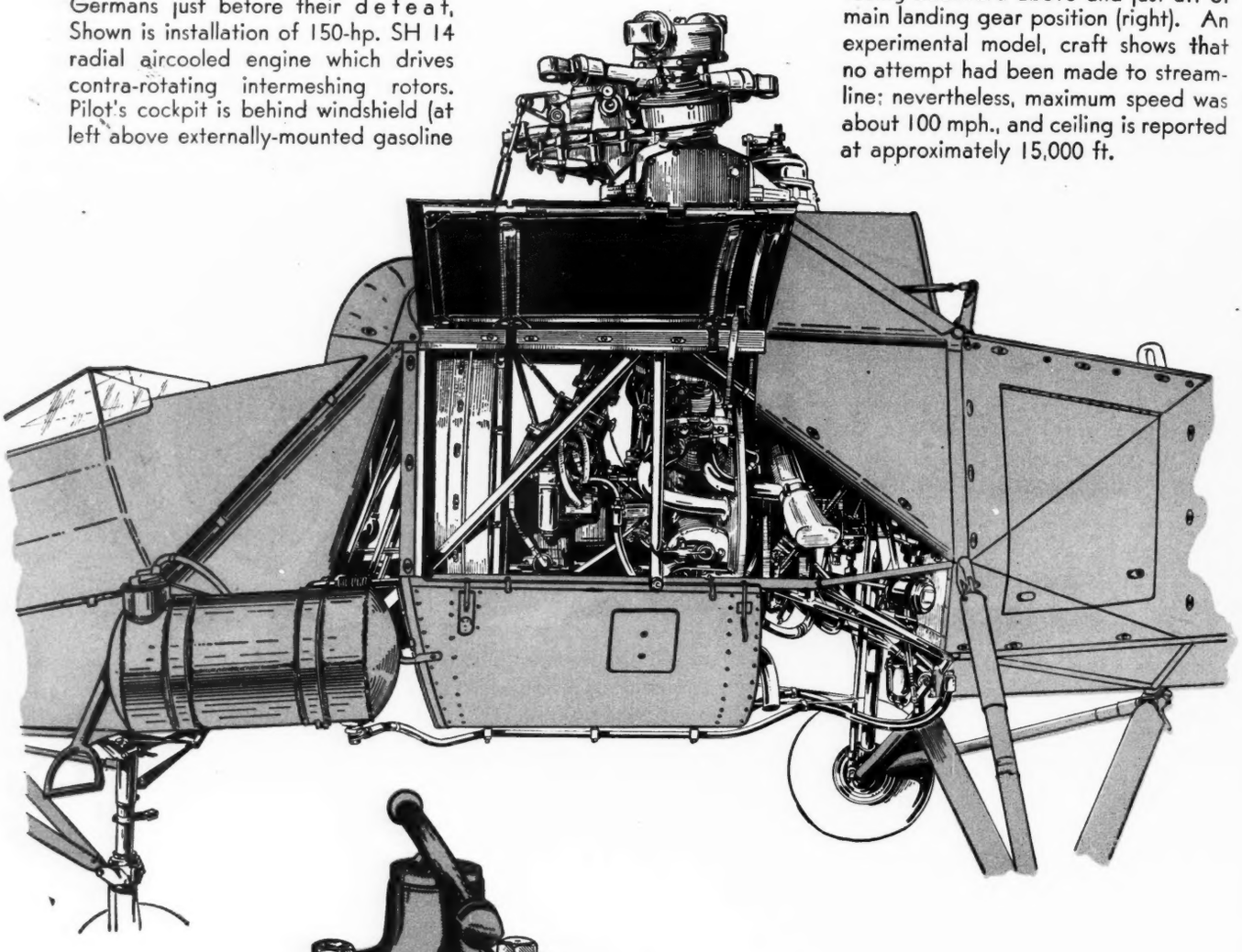
Closeup of right main landing gear of Trimmer. Built-up fitting (A) is bolted to fuselage through wood block (B). Pivot points of assembly are at (C), (D), (E), (F), (G), and (H). Retracting action is imparted by Lear electric actuator with 14,000:1 reduction gear through screw jack which lifts both wheels simultaneously. Metal fairings can be made interchangeable with two 10-gal. fuel tanks when wheels are removed for straight over-water operation.

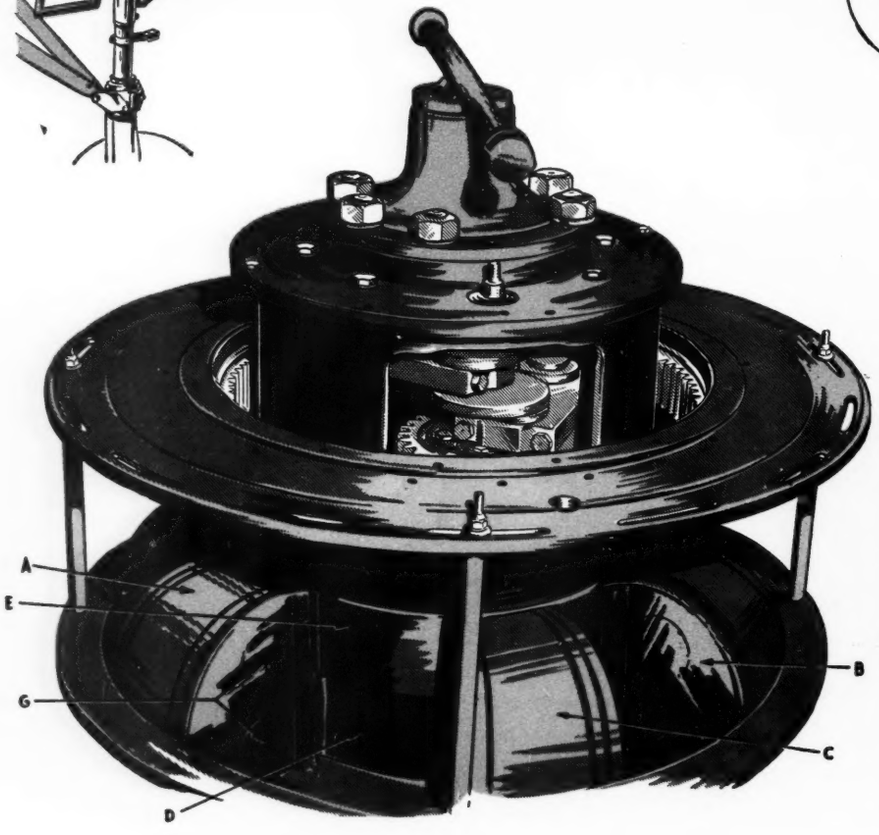
Interior of hull of Trimmer, looking aft from step and showing arrangement of formers and stringers, all of which are built up of laminated plywood and plastic bonded to plywood skin. Tubular metal cross member at rear of fuselage is tie-through between stabilizer attaching points.



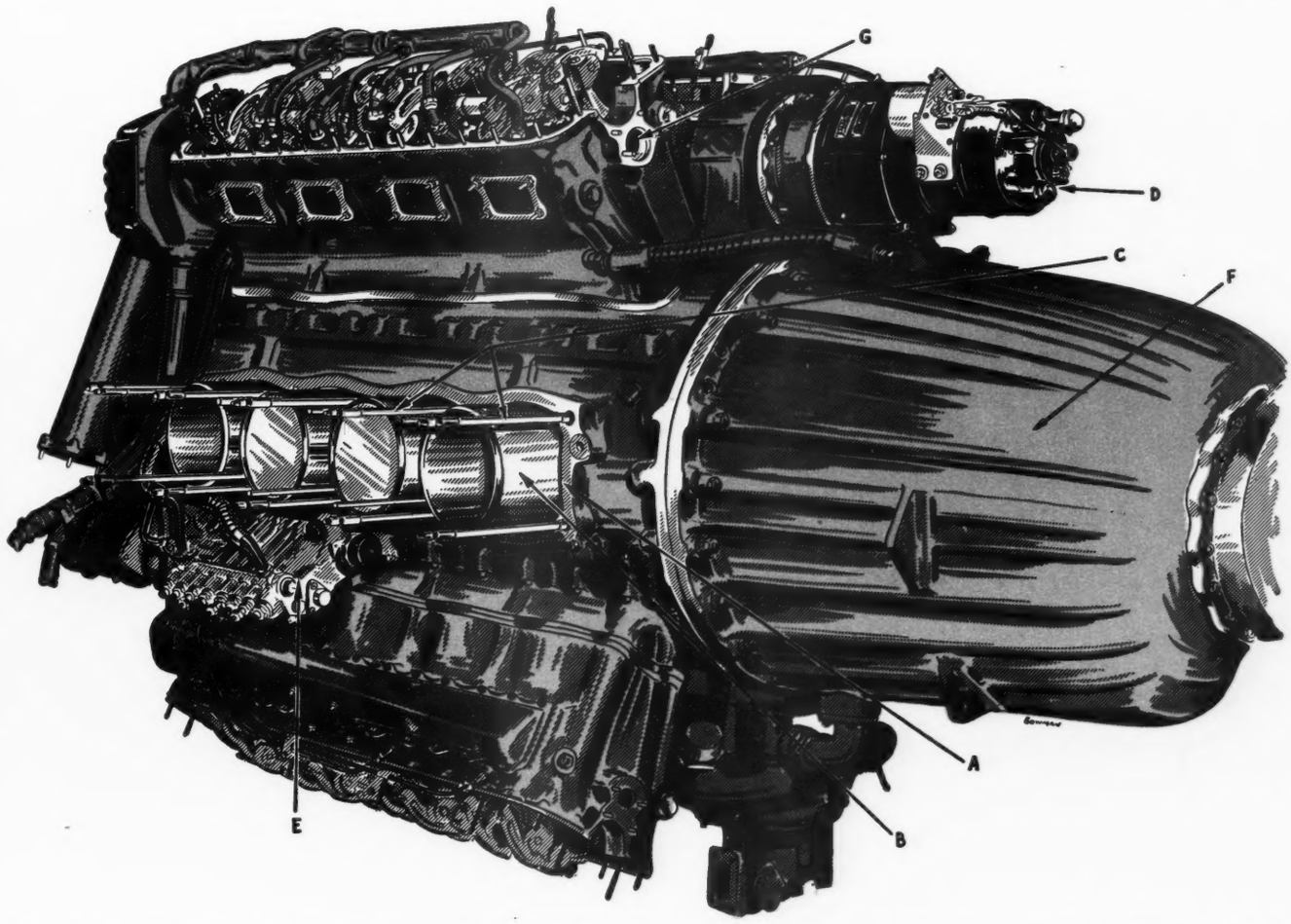
Left wingtip and portion of aileron of Trimmer, showing self-aligning ball-bearing hinge. Note small metal drains set in the fabric covering of both tip and aileron.

Left side of Flettner Fl-282 observation helicopter, which was developed by Germans just before their defeat. Shown is installation of 150-hp. SH 14 radial aircooled engine which drives contra-rotating intermeshing rotors. Pilot's cockpit is behind windshield (at left above externally-mounted gasoline tank), and passenger can be carried facing backward above and just aft of main landing gear position (right). An experimental model, craft shows that no attempt had been made to streamline; nevertheless, maximum speed was about 100 mph., and ceiling is reported at approximately 15,000 ft.

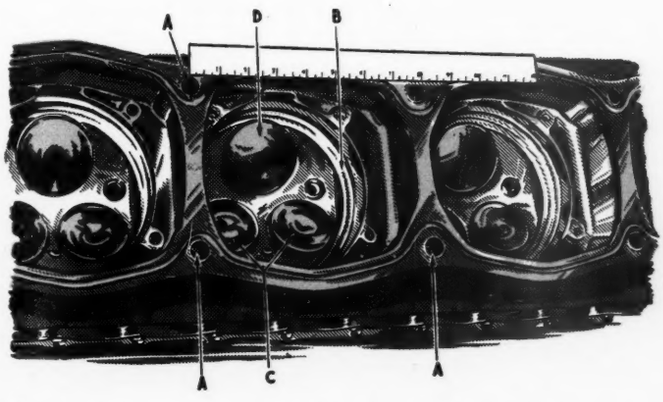




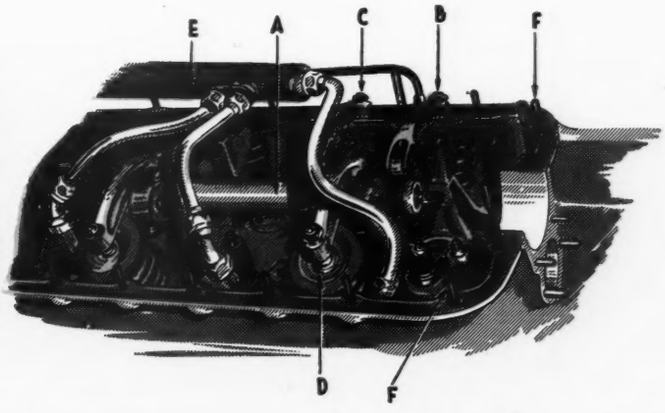
Cutaway section of German LFA free piston engine, showing two sets of pistons, each set being composed of three pistons each. Thus, pistons (A) and (B) are of one set, while (C) is of other set. Pistons (A) and (B) are connected by annular ring (D) and piston (C) to annular ring (E). While pistons rotate in same direction, the sets move consecutively so that compression and expansion takes place between pistons; three expanding and three compressing. Valves (G) are in piston heads, and exhaust gases can be used either for jet propulsion or as turbine power source.



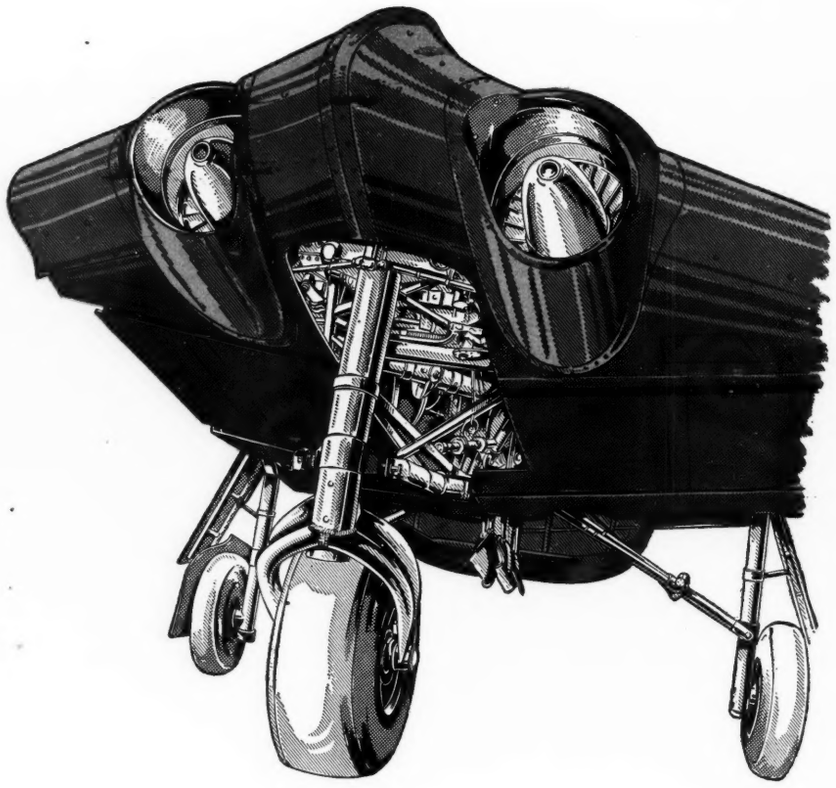
One of last German aircraft engines developed before war's end is this Junkers Jumo 222 which, with six banks of four cylinders each, develops approximately 3,000 hp. at takeoff. With cylinder head casings removed at (A), liners (B) are revealed. Liquid coolant flows around these liners and is ducted inside engine. Cylinder head is bolted to crankcase by studs (C). Engine is shown in normal position for mounting in plane, with generator (D) at top. One of three fuel injection pumps is shown at (E). Propeller drive shaft is mounted in long nose housing (F) which contains reduction gears. Coolant outlet pipe connection to cylinder head is at (G).



Sketch showing details inside Jumo 222 cylinder head. Mounting stud holes (A) are set 7 1/2 in. apart. Cylinder liners fit into conical bases at (B), enclosing cylinder when head is bolted on. Dual intake valves are shown at (C), and single exhaust valve is at (D).

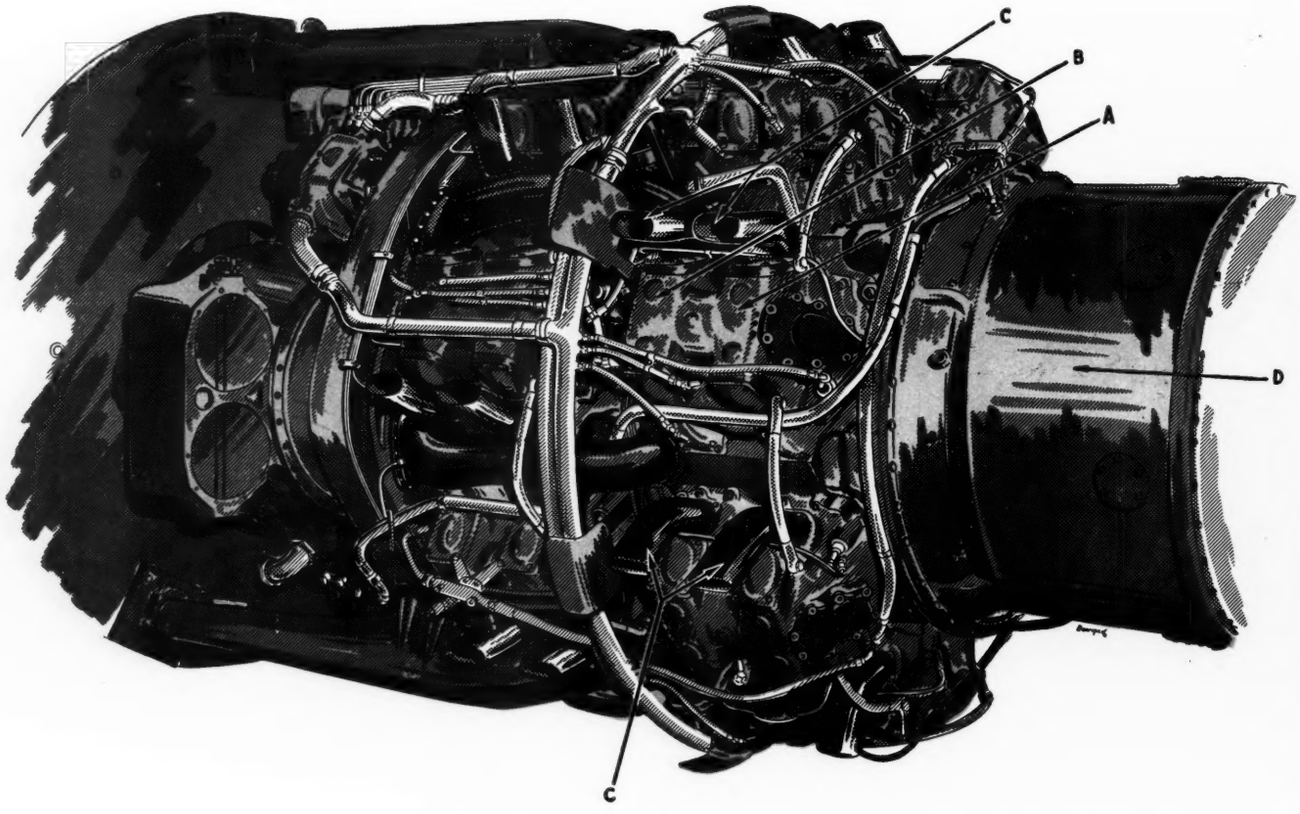


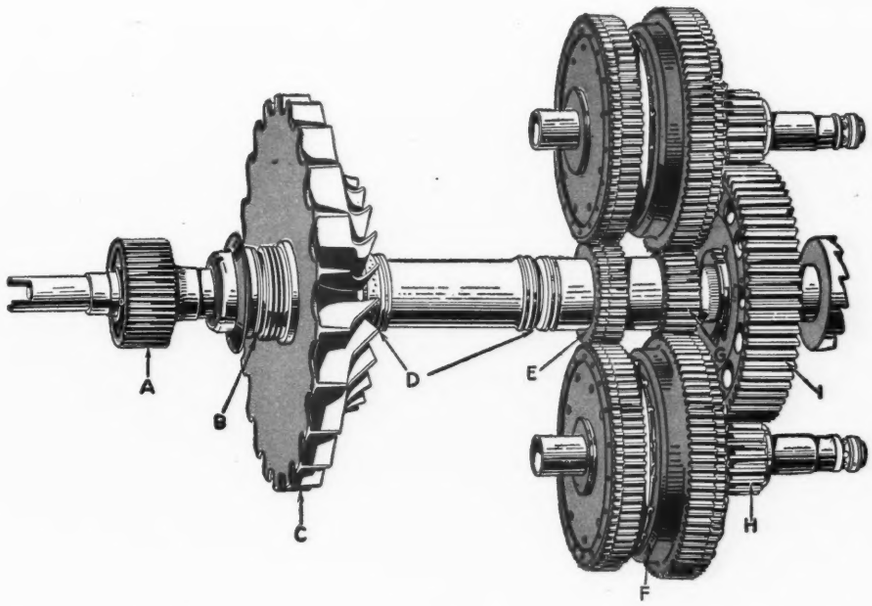
Details of valve mechanism of Jumo 222, showing overhead cam shaft (A) which actuates two inlet valves (B) and (C) and single exhaust valve (D). Ignition harness is at (E), and studs mounting cylinder head assembly to crankcase are shown at (F).



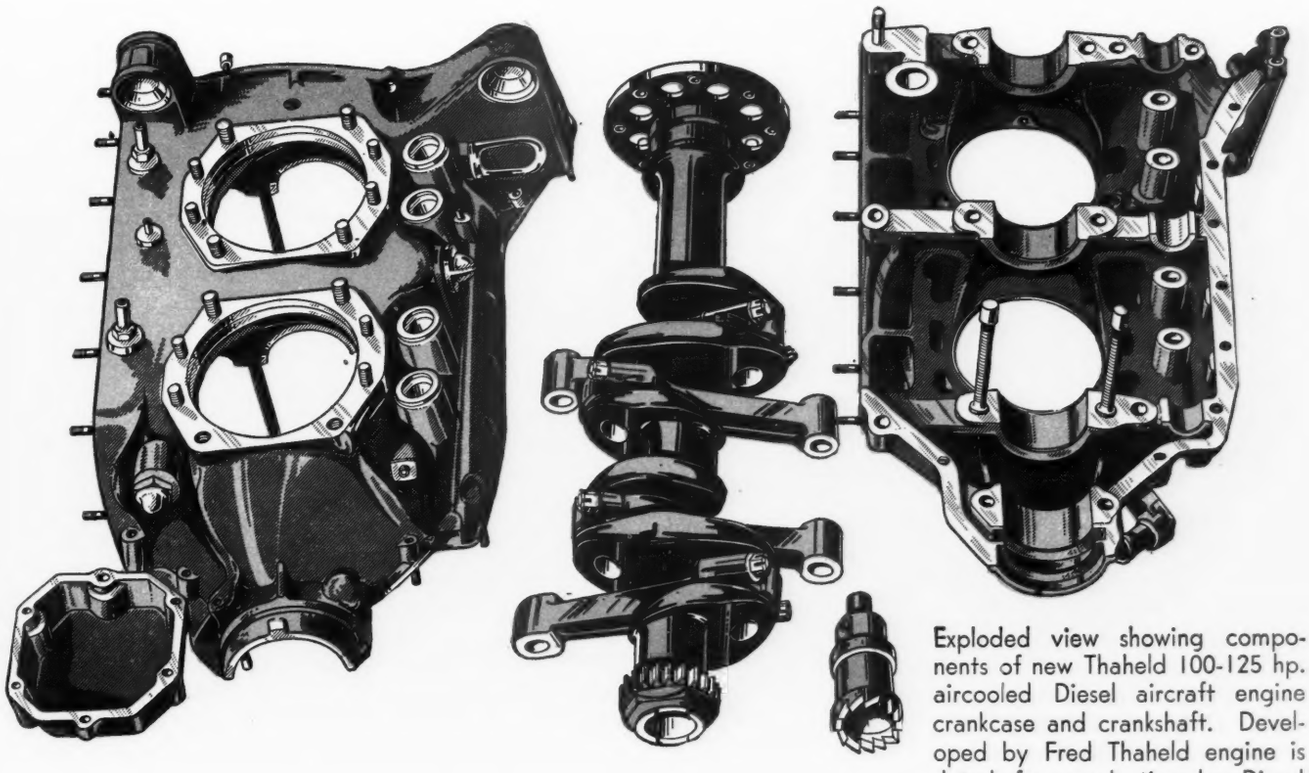
Center section of Horten 229 jet propelled flying wing developed by Germans shortly before their defeat. Landing gear retracts hydraulically, with nose wheel making 90-deg. turn to lie flat in well, and main wheels moving inward. This craft was designed to be powered either by BMW 003 or Junkers Jumo 004 axial flow gas turbine jet engines. (Other German jet-wings, P-60 A, B, and C, were described on page 172, Oct. 1045, AVIATION.)

Three-quarter front view of German BMW-803 engine, which is reported to have developed 4,000 hp. A liquid cooled power plant, it has seven blocks of two cylinders each, such as those at (A) and (B), attached to a corresponding seven-block 14-cylinder unit for a total of 28 cylinders. Each block of twin cylinders has a single head casting. Each cylinder has two sparkplug connections though they are not connected in sketch. Exhaust stacks are at (C), and propeller reduction gears are boused in nose section (D).





Gear train for two-speed drive on Pratt & Whitney supercharger, showing drive from crankshaft (A), crankcase seals (B), impeller (C), seals (D), low speed pinion (E), hydraulic clutch between secondary drive gears (F), high speed pinion (G), primary pinion (H), and supercharger primary driving gear (I). Sealing rings prevent mixture from leaking into either front or rear gear cases, also prevent oil getting into mixture section.



Exploded view showing components of new Thaheld 100-125 hp. aircooled Diesel aircraft engine crankcase and crankshaft. Developed by Fred Thaheld engine is slated for production by Diesel Power, Inc., of La Brea, Calif.

The Bearings that have never been Replaced

The six sturdy Timken Bearings in the main landing gear of the PCA Capitaliner shown above have never been replaced, even after thousands of landings under all conditions.

What's more, according to John Dale, PCA's lead mechanic, "No Timken Bearings have *ever* had to be replaced in the main landing gear of *any* PCA Capitaliner!"

Typical of the many outstanding performance records established by Timken Bearings for PCA is that of the veteran Capitaliner "Cleveland", which, in the words of Barney Vierling, PCA's Chief Engineer, "has just rounded out 16,761 hours of flight time. The "Cleveland" was drafted for military service by the Army Air Corps early in the war and has just recently been returned to PCA and is flying again on our regular routes."

"On the basis of airline estimates," Vierling continues, "this plane has made a total of 13,027 landings — averaging four landings for every three hours of flight during military service, and one landing per hour during commercial work."

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If stamina like this—plus the other unique features of matchless Timken Bearings —can work for you, write us. Our engineers will be glad to make specific recommendations. The Timken Roller Bearing Company, Canton 6, Ohio.

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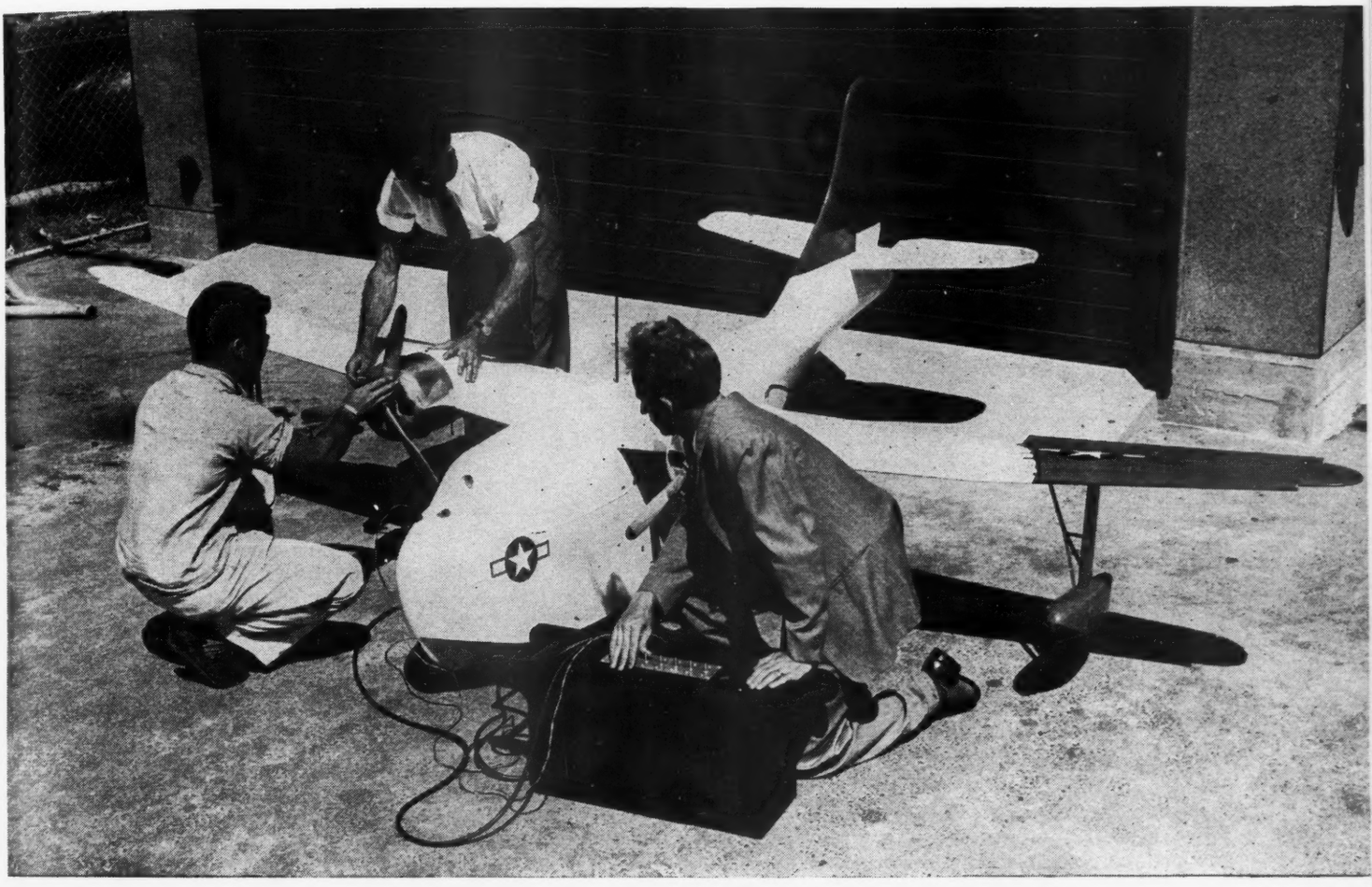
TAPERED ROLLER BEARINGS



Crew of three is required to start model's midget engines. One man controls switches on battery box, another spins propeller, while third adjusts engine.

Radio-Controlled Dynamic Model Augments Hydrodynamic Research

By ERNEST G. STOUT, *Staff Engineer in Charge of Hydrodynamics, Development Design Staff, Consolidated Vultee Aircraft Corp.*

Sparking accurate study of seaplane dynamic characteristics prior to takeoff and while landing, this newly developed remotely guided free-flight model — a distinct research refinement — features ingenious midget power plants and control components.

DESIGN OF MODERN AIRCRAFT—particularly in the larger sizes, where the first prototype may cost as much as five to ten million dollars—is constantly being enhanced by new and refined methods of experimental research, prime aim being to reduce risk of trial-and-error modification on the first flight test product. For aircraft manufacturers cannot afford to gamble on estimates and predictions based upon unreliable experimental research.

In recent years, great progress has been made in improving reliability and accuracy of various experimental procedures available to the designer. In the field of aerodynamics, wind tunnels of various types have been developed to an amazing degree of sensitivity, so that the effect of the most minute variations in form and contour can be measured. And huge engine tunnels have been constructed which simulate all conditions of flight so that engine performance is known accurately from sea level to stratosphere, from desert to arctic regions.

Corresponding to the wind tunnel is the towing basin—for determination of hydrodynamic characteristics of flying boat hulls and seaplanes. Here too, considerable progress has been made in

accurate determination of resistance, hydrodynamic instability (porpoising), and skipping (landing instability).

One of the major contributions to towing-basin determination of seaplane design was the development of the dynamically similar model. Such a model is not only a geometrical scale duplicate of a contemplated or existing full scale airplane but is also built to scale in gross weight, moment of inertia, and wing lift rate. This enables takeoff and landing of the model at scale speed, and also permits study of the dynamic characteristics of a specific flying boat. Recently, another refinement was made in the dynamic model by the addition of powered propellers which develop scale thrust. This became necessary because engine horsepowers have rapidly increased with corresponding decrease in power loading. Multi-engine installations—resulting in a considerable effect of slipstream and propeller rotation on spray and stability—were of fundamental importance.

With the addition of running propellers to the dynamic model, two more necessary refinements were realized. In the towing basin, the models had only freedom to pitch and rise. Furthermore, acceleration effects accompanying the reduced power loadings have a tremendous effect on spray and stability. Attempts were made in the towing basin to give the models freedom about all axes and to match full scale accelerations encountered prior to takeoff. However, the difficulties encountered necessitated a different approach to the problem of accurate determination of the dynamic characteristics of a seaplane during takeoff and landing. For the past two years, the author, together with the hydrodynamics group and members of the radio laboratory at Convair, has been occupied with the development of a radio-controlled dynamically similar free-flight model with which to make the foregoing studies.

At the time the development of a remotely controlled free-flight model was undertaken, no information on a project of this nature was available. It was known that numerous attempts had been made to control flying models by radio, but no successful system was known. Hence, the present system—so far as we understand—is unique. Its development was entirely independent of any existing remotely controlled system.

The enormous amount of wind tunnel, towing basin, and full scale testing of the CVAC Model 31 flying boat made this craft the logical choice about which to center the development, thus giving direct correlation of the results obtained from past tests and the free-flight model. First, the scale of the model was determined. Since all towing basin data had been obtained on a $\frac{1}{8}$-scale model, this scale was used for the free flight model, and resulted in the following model specifications for dynamic and geometric similarity:

Wing span	13.75 ft.
Beam	13.75 in.
Overall length	9.25 ft.
Propeller dia.	2.0 ft.
Bhp./eng. (approx.)	2.0
Gross weight	89.98 lb.

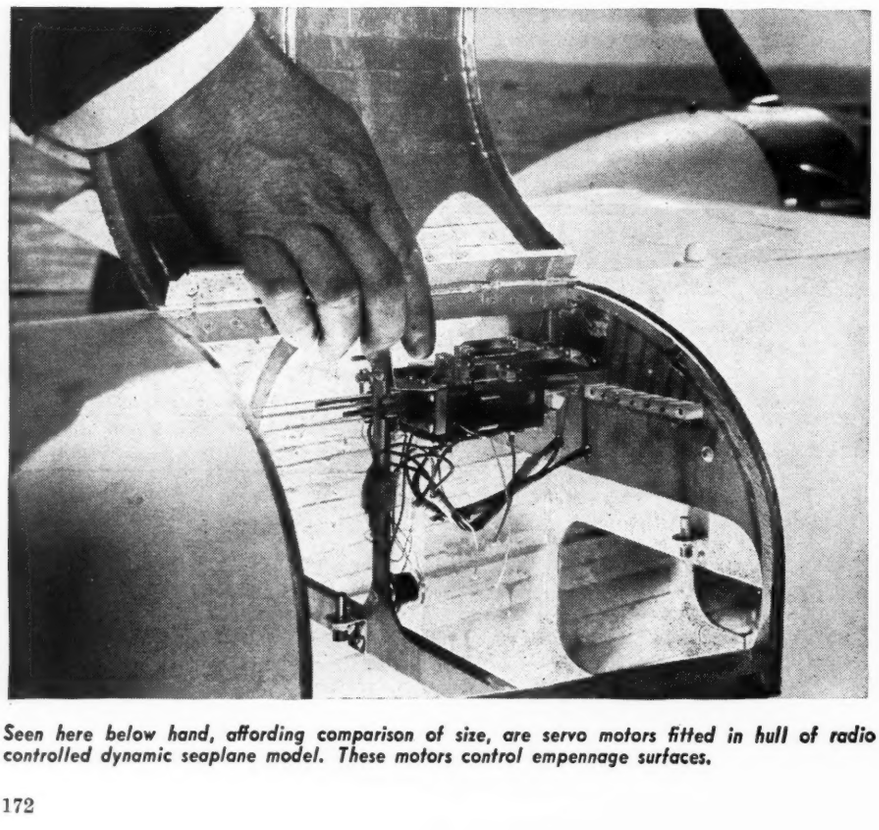
No power plant was available which would give 2 hp. and weigh only 3 or 4 lb. No dependable method existed for motivating the control surfaces. Nothing had ever been heard of a radio receiver capable of actuating seven controls with positioning accuracy of $\pm 1.25\%$ and weighing no more than 20 lb., complete with battery pack. Thus, the problems pyramided rapidly.

Power plant specifications were drawn. Ohlsson & Rice Mfg. Co. (Los Angeles) agreed to make the engines, which were to fit inside a 9-in. dia. cowl, weigh approximately 3 lb., deliver about 2 hp. at 5,000 rpm., and have complete throttle control from idling to full throttle. Four months later, the first experimental engine was completed. This fantastic midget power plant—a two-cycle twin-cylinder opposed-type gasoline engine, displacing 2.77 cu. in., and weighing only 3.4 lb.—met all power requirements. For the Model 31, the engines power $\frac{1}{8}$-scale duplicates of the 16-ft. Curtiss Electric 3-bladed propeller used on the full scale airplane, at 4,200 rpm. —simulating the scale thrust of the full scale engine-propeller characteristics.

Glenn Nay of Convair's radio laboratory, who undertook the design and development of the servo motors to actuate the throttles and control surfaces, produced an extremely efficient motor and jack. Complete unit is a split field reversible d.c. motor geared to a jack screw, developing 14 lb. of draw-bar push or pull, and weighing $2\frac{3}{4}$ oz. Nay named the development the "multi-dyne linear actuator".

Complex task of designing and developing the radio receiver and transmitter was assigned to Victor Welge of Convair's radio lab. The transmitter—a duplication of a pilot's cockpit, less the instruments used in a full scale airplane—presented many problems. Major consideration was to build a receiver which would accurately position, simultaneously or singularly, the model's seven controls. This would not have presented great difficulty if the weight of the receiver could have exceeded 150 lb. Since the gross weight of the model was not to exceed 90 lb., only 15 lb. could be allotted for the radio receiver. This meant that all components of this delicate instrument not only had to be meticulously designed, but also, hand-manufactured.

The various circuits were worked out with methodic precision. Days would pass with no work on the radio gear being evidenced, while Welge would be busy thinking out the difficulties—with the invariable result that another small component part did its job better. Weeks



Seen here below hand, affording comparison of size, are servo motors fitted in hull of radio controlled dynamic seaplane model. These motors control empennage surfaces.

were required for the development of the tuning coils—simple, when the final product was obtained, in that they were only a few turns of some very ordinary wire. But these simple turns of wire had to be exact as to length, with just the right number of turns, and precisely spaced.

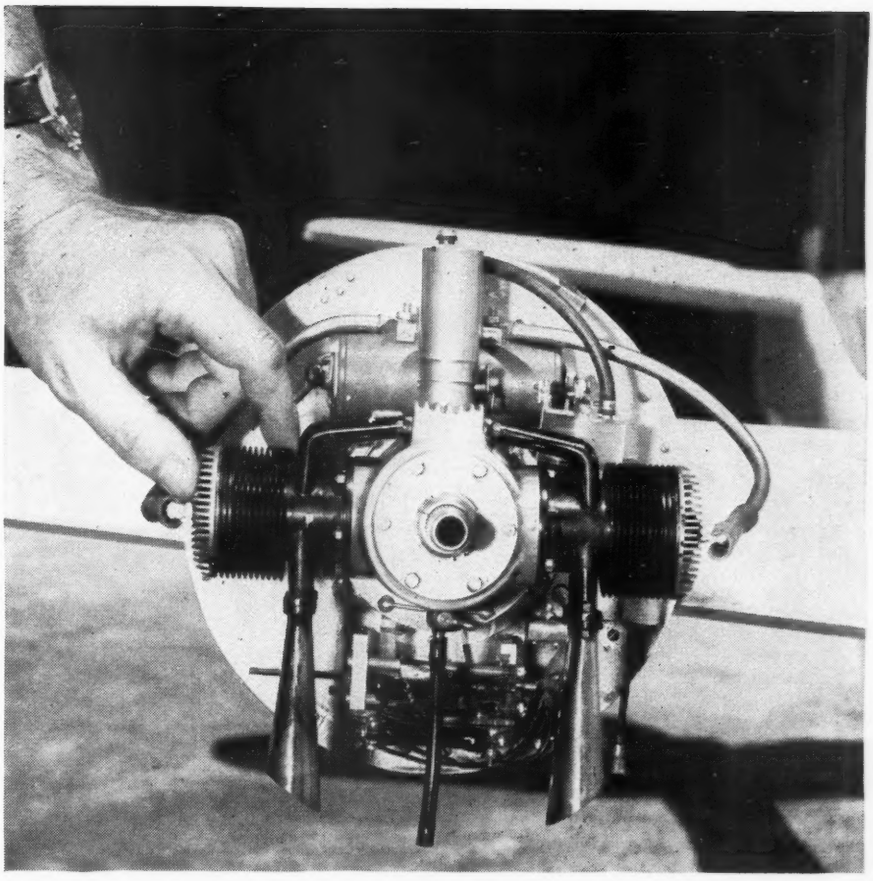
And so, with occasional help from other members of the radio lab, the work progressed. For 14 months, circuit after circuit was added to the receiver's Plexiglas chassis; and supporting a mass of wires, tubes, relays, and other devices, it finally was placed in a $6 \times 6 \times 15$ in. box, mounted in the model together with the battery pack. And so the model came to life. The "pilot", sitting at the transmitter, could control the two throttles, elevator, rudder, ailerons, flaps, and ignition in any conventional manner.

The model—designed by Convair's hydrodynamics group and built in the model shop—is a geometric duplicate of the full scale plane, except for addition of leading edge wing slots, which are necessary to duplicate full scale lift characteristics. Wing and hull are of balsa monocoque construction—resulting in a higher strength-weight ratio than that of the full scale plane. Another saving in weight was made by Metlbonding the wing spars and using Plexiglas fittings wherever possible. Tail surfaces are of the conventional ribbed type, covered with silk. Propellers machined from 24ST dural, are adjustable in pitch, and propeller shaft and hub have standard SAE splines.

The model is equipped with a special 8-mm. motion picture camera, trim indicator, speed indicator, and sweep second timer. The camera is interconnected to the starboard throttle and can be operated at will, enabling continual flight records to be made of takeoff and landing.

One of the unique features resulting from this development is the method of measuring the aerodynamic forces. A station wagon was rigged with a quickly detachable trusswork supporting a roller cage in front of the car, and the model was mounted in a yoke which was fastened into the roller cage. Strain gages were located on the yoke to measure the forces acting on the model. Simultaneous readings were made on the strain gages and on a sensitive low speed airspeed indicator mounted near the model. This enabled six component data to be readily computed. Comparison with wind tunnel results showed very good agreement of lift, moment, and elevator effectiveness.

As previously stated, the model is also dynamically similar to the full scale craft. Weight of the model, complete with engines, propellers, fuel, instruments, receiver, battery pack of B, C, and 14v. of wet cell A batteries, is 83 lb.—42,500 lb. full scale. Since the scale gross weight is approximately 90 lb., this permitted about 6 lb. of lead ballast to be added to balance the model with pitching moment of inertia to scale.



Front view of 2-cyl. engine developed specially for dynamic model. Radio controlled servo motor for engine throttle is seen at bottom center on firewall.

Engines are started by hand from a booster battery, and fuel-air mixture is also adjusted by hand. When everything is ready, the booster battery is disconnected, the radio, with ignition switches, turned on, and the model becomes controlled from the transmitter. The reason for the auxiliary batteries is to extend the life of the model's battery pack.

There are two safety features in the model. If the plane assumes an abnormal attitude, the transmitter can be turned off to cause all controls to home to a predetermined position. This will also happen automatically if the plane flies beyond the range of the transmitter. The other safety feature is that it is possible to turn off the ignition, if desired.

The transmitter is equipped with trimming knobs which trim the zero position of the rudder, elevator, and throttles in event of any variations—saving a considerable amount of time that might otherwise be spent in adjusting for the slight day-to-day variations in the radio equipment.

As already noted, the primary purpose of the development was to study accurately the dynamic characteristics of seaplanes prior to takeoff and while landing. With the 3,000-ft. range of the radio equipment, C.G. limits of hydrodynamic stability can be readily obtained. Landing characteristics can be studied with variations of trim and sinking speed, and seaworthiness determined for various degress of wind and sea conditions. The excellent results obtained thus far have stimulated studies on the possibility of determining dynamic flight characteristics by the use of free-flight remotely controlled models. Consequently, an automatic gyro-pilot, which will weigh approximately 5 lb., is now under development.

In addition to stability criteria, this equipment will lend itself to all forms of hydrodynamic research—such as hydrofoil studies, hull forms, auxiliary sustention, and high lift devices. Also, the effects of modifications to existing flying boats can quickly and accurately be determined. And, finally, the time from conception to production of the full scale airplane will be measurably reduced.

THE AVIATION NEWS

BLAINE STUBBLEFIELD, Washington HERB POWELL, New York E. J. BULBAN, New York

Navy Asks Council, Board For Land-Sea-Air Control

. . . "Air Navy" gets accent . . . ATA in strategic revision . . . Other national news.

The Navy, switching from negative to constructive measures regarding proposals in Congress for a unified land-sea-air command, suggests a National Security Council and a National Security Resources Board to coordinate all defense activities, leaving Navy autonomy intact, and providing a separate Air Force. Navy Sec. Forrestal's plans for husbanding resources, and for assuring civilian control of the military, are taken seriously; but the opposition says his program would not eliminate rivalries, waste, and duplication, so apparent in the war, and that fundamental unification is the only answer.

"Air Navy" Gets Accent

Meanwhile, Navy moved a step nearer to "air navy" status by ordering that officers trained as aviators henceforth will occupy three of the six key positions under the Chief of Naval Operations in Washington. At sea, Adm. John H. Towers, air officer now head of the 5th Fleet, will relieve Adm. Spruance as chief of the Pacific Fleet. Vice Adm. Marc A. Mitcher, now Deputy Chief of Naval Operations for Air, will command the 8th Fleet. Vice Adm. D. C. Ramsey will command the Atlantic fleet, of which he is now deputy chief. Adm. Nimitz will name an air officer to be Deputy Chief of Operations, and another to be Deputy Chief of Operations for Air. Unification men consider these orders to be part of a move in opposition to conjoining of Army and Navy.

ATA In Strategic Revision

Aiming mainly at expansion of the airlines, and mastery of the problems of all-weather flying, the Air Transport Assn. has reorganized, with ex-Congressman Robert Ramspeck (Ga.) and Gen. Milton W. Arnold appointed vice presidents, and with plans to appoint a president to succeed the late Col. Edgar S. Gorrell.

Latter post has been offered to Adm. Emory S. Land, Chairman of the Maritime Commission. Stuart G. Tipton, acting president, will resume his duties as general counsel. John Groves and A. W. Dallas will assist Gen. Arnold with technical work. Mr. Ramspeck is the overall administrator.

Army officials expect that ODT's Order 58, taking over 70% of airline eastbound seats for returning servicemen, will be terminated about Apr. 1. Re-deployment of troops began declining after Jan. 1. By mid-March 1,200 rail troop-sleepers will take a good share of the load. Order 58 resulted in the airlines moving about 20,000 troops per month, as against predictions of about 25,000.

Air Forces plans call for 400,055 officers and men, and 8,200 operational airplanes, plus 6,000 in the air reserve and national guard. This force is considered adequate for defense and for participation in proposed international police force. It compares with 354,161 personnel and 10,327 aircraft at outbreak of war. Program must be approved by Joint Chiefs of Staff and by Congress.

Navy Research Laboratory discloses it is working on atomic energy sources to increase range of submarines. Dr. Ross Gunn, of NRL staff, told Senate Atomic Energy Committee that large cargo submarines employing atom power are also now being planned.

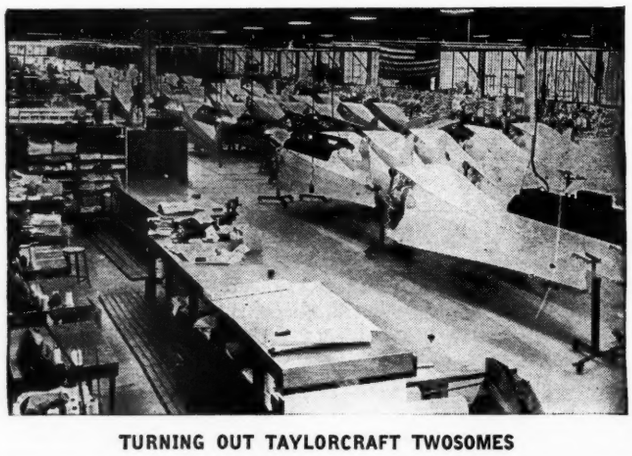
Air Technical Service Command, at Wright Field, reveals it is shifting from development work to long-range research in supersonic speeds, new propulsive forces, pilotless aircraft, and aid to human body at high speeds. ATSC's total expenditures in war were $36,000,000,000; 288,000 aircraft, including 16,000 gliders, were procured; production of airplanes for Army has dropped from about 5,000 per month to 150.

Coast Guard has been transferred from Navy back to Treasury. Accordingly, CG now resumes peacetime coastal and port patrol, aid to ships in distress, ice patrol, and aids to navigation. Personnel has now dropped from 172,000 to about 100,000.

In his annual report for 1945, T. P. Wright, CAA Administrator, says manufacturers report orders for 40,000 personal airplanes, compared with best previous year, i.e., 6,844 in 1941; 70,000 student certificates were issued in 1945 compared with 30,000 in 1939; discharged military pilots are receiving certificates at the rate of 1,000 per week; the airlines have placed orders for more than 500 new transport airplanes, more than doubling the existing fleet. A later AIA figure on personal plane orders puts call for craft up to 50,000.

Mr. Wright says that civil aviation "has entered a period of tremendous expansion, in which the Federal Government is playing a necessarily important role." CAA employs about 11,500 men and women, about 10% of them in Washington. Annual report outlines accomplishments of CAA during past year.

CAB has a complete statistical analysis of 3,343 non-carrier aircraft accidents in '44 classified by nature of accident, and giving data on injuries, damage to airplanes, cause of accident, etc.



TURNING OUT TAYLORCRAFT TWOSOMES

Taylorcraft's final assembly line at Alliance, Ohio, on which production was 15 planes daily, and is expected to reach twice that this month. Reported are cash deposit orders for well over 7,000, or more than that produced by entire personal plane industry in last peacetime peak year of 1941. New 68,000-sq. ft. wing of plant is wholly occupied by welding and assembly operations on $2,995 Twosome. In right foreground are craft ready to be sprayed, while farther down line planes await wings, tail surfaces, and engines. In background, alongside windows, are seen fuselage skeletons of the next batch of craft.

COMING UP

Feb. 4-7: American Welding Society National Meeting, Hotel Cleveland, Cleveland.
Feb. 4-8: National Metal Exposition, also the National Metal Congress, Public Auditorium, Cleveland.
Feb. 4-8: American Society for Metals' postponed 1945 Annual Convention, Statler Hotel, Cleveland.
Feb. 4-8: American Institute of Mining & Metallurgical Engineers, Iron & Steel and Institute of Metals Divs. National Meeting, Statler Hotel, Cleveland.
Feb. 12: IATA European Rate Conference, Paris.
Feb. 20-21: Shreveport Aviation Conference, Shreveport, La.
Feb. 21: IATA Middle East Rate Conference, Cairo.
Feb. 26-28: ATA Engineering & Maintenance Conference. (Place not yet specified.)
Mar. 1-5: Pan American Aircraft Exposition, Dallas.
Mar. 4: PICAO North Atlantic Regional Conference, Dublin.
Mar. 8-16: Southwestern Aviation Exposition, Ft. Worth.
Mar. 12-18: NAA Second Northwest Annual Airshow, Minneapolis Auditorium, Minneapolis.
Apr. 3-5: SAE National Aeronautic Meeting, Hotel New Yorker, N. Y. C.
May 7-9: National Assn. of Corrosion Engineers, Annual Meeting and Convention, President Hotel, Kansas City, Mo.
July 19-20: NAA National Convention, Omaha, Neb.
Oct. 14-17: National Aviation Clinic, Oklahoma City.

CAA is making recommendations in re disposition of 700 war surplus airports by RFC. In some cases, says CAA, only a portion of a very large field should be turned over to a local government; some fields do not fit into "National Airport Plan"; interim permits now allow operation pending final transfer.

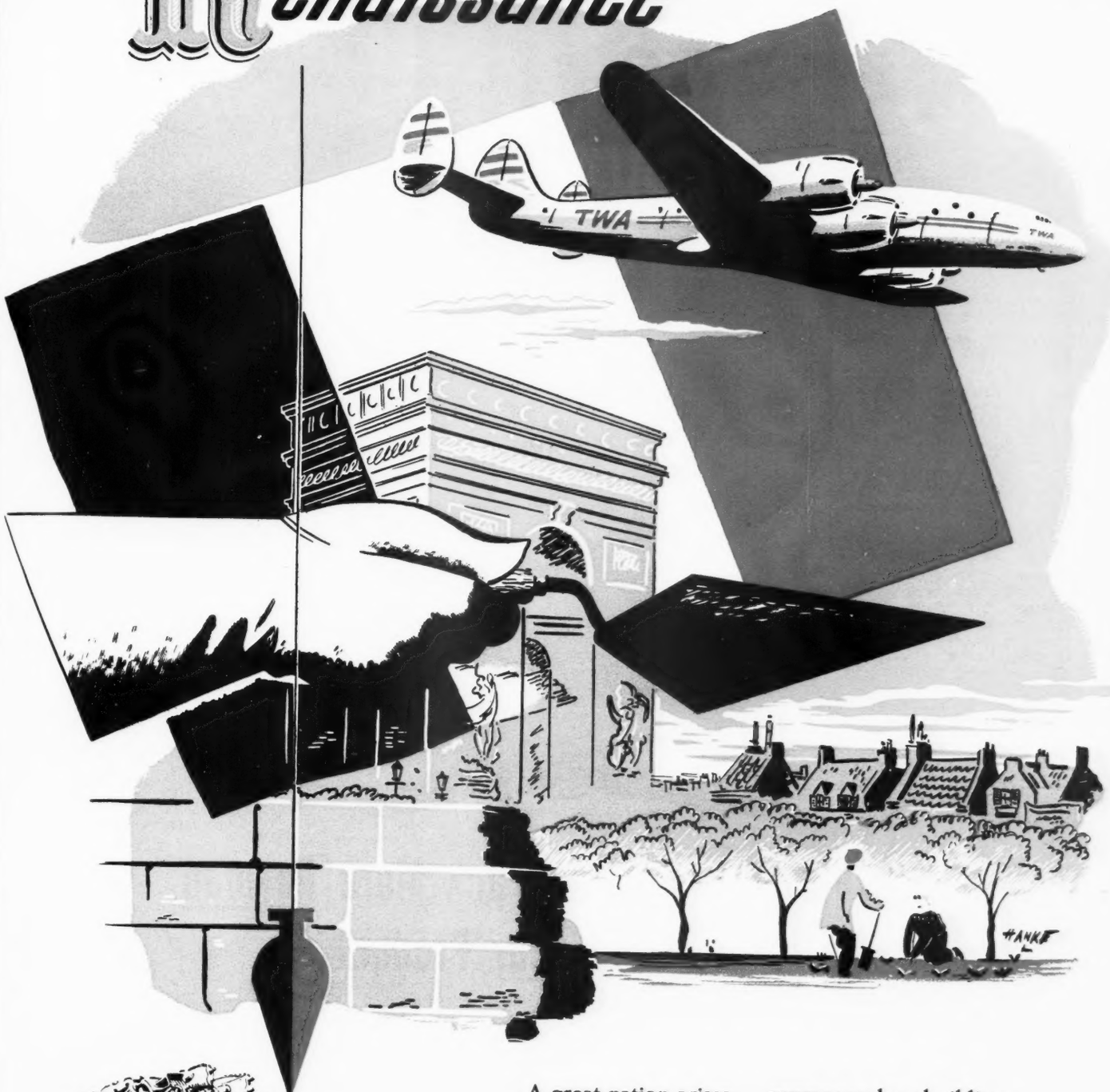
Foretelling future pilotless combat via electronic control, Navy displays a new jet-propelled robot—capable of 600 mph. after it is launched from wing of a mother plane, and of maneuverability equal to that of latest fighters. Complete radio control of pilotless airplanes, such as Grumman Hellcats, is predicted.

War Department announces creation of a new staff section of Air Forces Headquarters to coordinate all research and development. It will be headed by Maj. Gen. Curtis E. Lemay, with hq. in Washington.

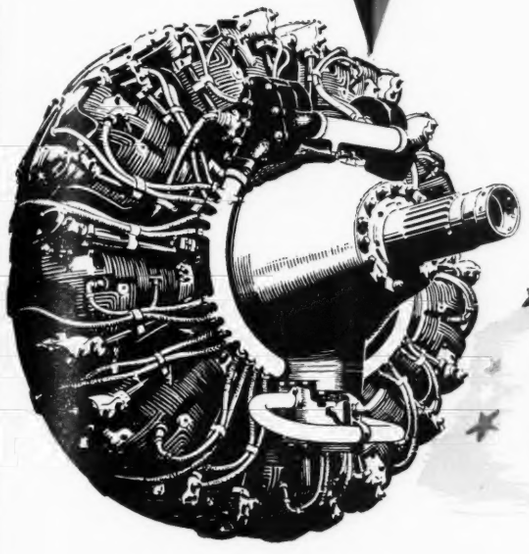
RFC reports that surplus basic trainer aircraft are for sale at $975 each for a period of 90 days (from Dec. 17). Because of limited utility, only about 100 of this type have been sold.

CAA has replaced about 231 of its obsolete planes with craft from Army and Navy surplus. Two Douglas C-54s go to Standardization Center at Houston to familiarize inspectors with converted 4-engined equipment now

Renaissance



A great nation arises . . . courageously rebuilding,
planting, producing . . . renewing its trade with all the world
. . . a resurgence speeded on the wings of
Lockheed Constellations, powered by Wright, flown by TWA.



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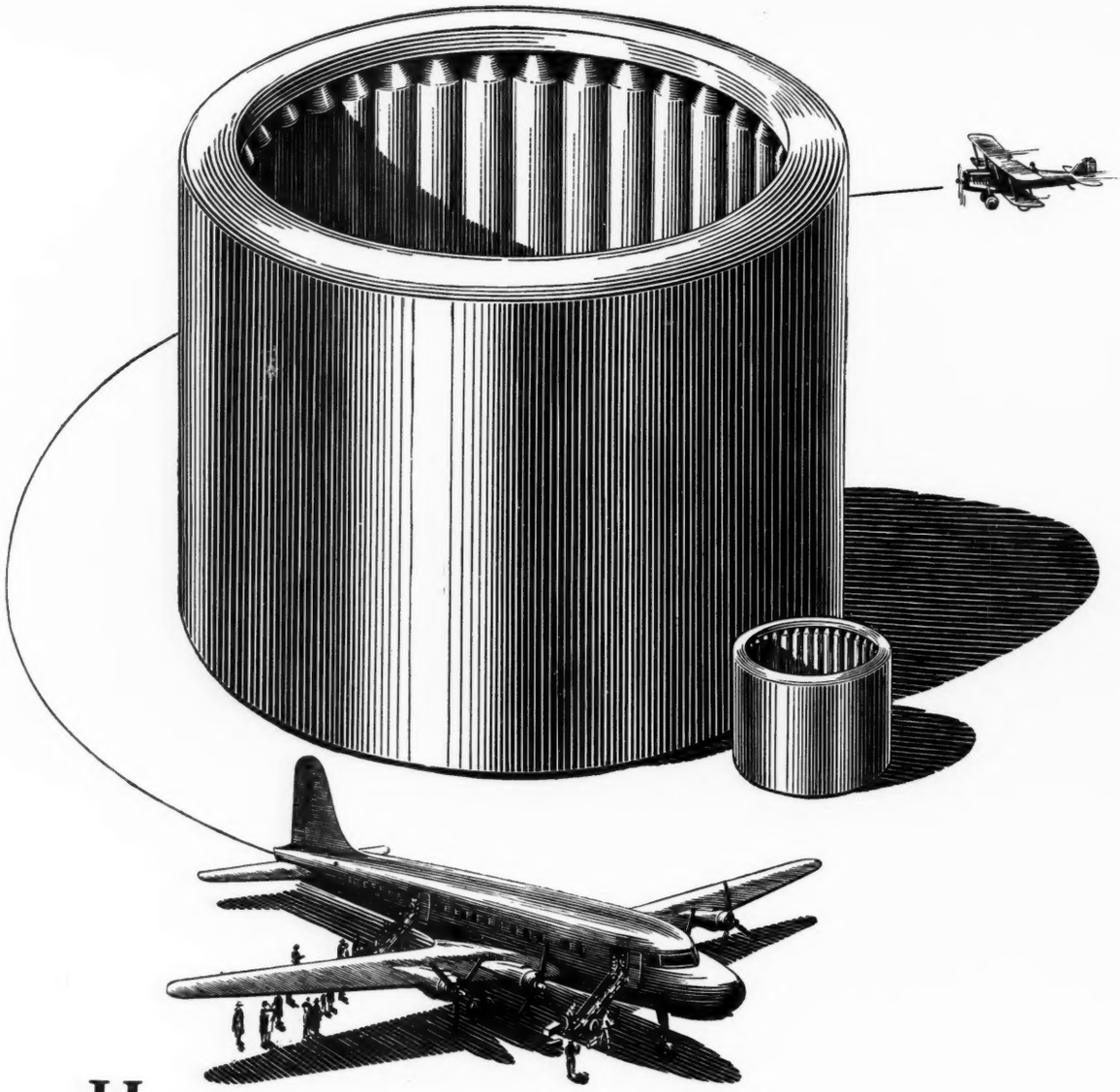

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Wright Field, Ohio, Army aircraft engineering and procurement center, has received 250 tons of data on German Air Forces. It will be analyzed and made public. Sorting, screening, photographing, cataloging of the 500,000 documents was begun last June 15. Indications are that Luftwaffe was superior to American and British aviation only in jet power.

Use of radar devices for firing aircraft cannon is disclosed by Wright Field. Big problem, on which work was begun in 1940, was reduction of weight and bulk.

"Shoran", one of last radar systems for bombing through overcast to be applied in Europe before VE-day, scored an average of nearly 70% success for all attacks, according to ATSC. Device was developed by Electrical Subdivision, at Wright Field, in cooperation with Radio Corp. of America.

Greece has accepted Interim Agreement on International Civil Aviation and International Air Services Agreement, thus becoming 37th member of PICAO. Acceptance means other states will have right to fly across Greek territory without landing, or to land for non-traffic purposes.

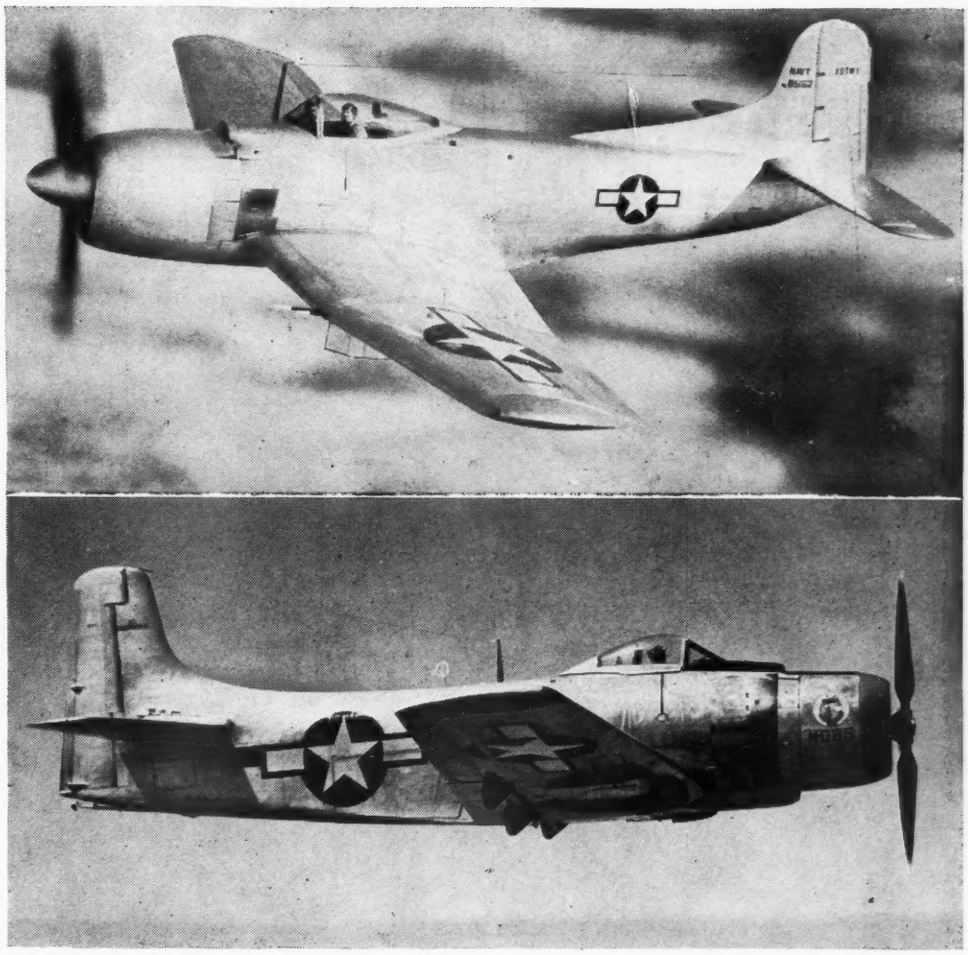
How Soviet's aviation industry has reconverted to help fill country's broad peace needs is evidenced in a recent report from Moscow. Checkup showed that in fourth quarter of '45 reconstituted aero plants turned out 25 thousand bicycles, 4 million household utensils, 30 thousand meat mincers, 40 thousand beds and cots, 2 million spoons, 2 million thermometers, 30 thousand sleds, 40 thousand door locks, 25 thousand tea and coffee pots, 20 thousand primus stoves, and 10 thousand perambulators. It is stated this is partial list. As example of work of single plant, one partly reconverted aircraft factory made products which included 120 launches, 400 other boats, 3,500 beds, 5,000 toys, and 200,000 spoons, together with some axes, laundry tubs, spare parts for tractors, and equipment for Moscow subway and Moscow-Saratov gas pipeline.

Institute of the Aeronautical Sciences makes announcement of five national meetings this year. Schedule is as follows: Aircraft Propulsion, Mar. 21-22, Cleveland Club, Cleveland; Light Aircraft, June, Rackham Educational Memorial, Detroit; Annual Summer Meeting, August, Los Angeles; Air Transport, October, Hotel Statler, Washington, D. C.; and Wright Brothers Lecture, Dec. 17, New York City.

Texas Engineering & Manufacturing Co. signed contract with Globe to build more than $6,000,00 worth of Swift personal planes. This and other contracts will require about 350,000 sq. ft. of additional space in former NAA plant now used by company.

Continental plans to start production of a new Diesel engine line and a new hydraulic controllable pitch propeller as soon as tooling is completed. Company has orders for more than 3,400 engines in 65 hp.-210 hp. range. Also continuing is research on gas turbines.

Beech completed reconversion of Wichita plant to civilian production and started deliveries of twin-engined Model 18. Work is now in progress on a feederline version of this type.



NAVY'S NEW SINGLE-PLACE TORP TOSSERS

Two of Navy's latest torpedo-bombers, designed for carrier operations, show trend toward using single seaters for TB task, thus giving type added speed and maneuverability. Although made by two different companies, craft show decided similarity in design, suggesting that Navy set up specifications. Top: Martin XBTM-1 Mauler is a low-mid-wing design fitted with four .50-cal. machine guns in wing leading edges. Low aspect ratio wings, with decided dihedral, are craft's leading identification marks. Above: Douglas BT2D-1 Dauntless 2 features a low-wing arrangement with pilot seated almost over leading edge, thus affording maximum combat visibility. High squared-off rudder and long slab-sided fuselage make this plane easy to identify. Note streamlined wing flap arms. Landing gear folds flush beneath wings, turning 90 deg.

C-W completed arrangements to present its Buffalo research laboratory and wind tunnel to Cornell for a cooperative research - educational program supported by several eastern aircraft makers.

Entitled "Radio Equipment for the Private Pilot", a new report by CAA summarizes latest plans for VHF radio facilities. Agency states that major features of study can be used as a basis for design of such equipment.

Martin received orders for 33 Model 202 airliners—18 for Braniff and an additional 15 to CAL's original order. UAL ordered 35 of newer Model 303, pressurized cabin version of 202. Company is also busy converting Douglas DC-4s for domestic and foreign airlines, with contracts amounting to over $13,500,000.

Luscombe moved all operations from Trenton, N. J., to Dallas, where deliveries have already been made since last October.

Aeronca plans expansion of present production of 20 craft daily to 35 daily shortly. Present model coming out is Champion, to be followed by Chief, and later by low-wing Chum.

AiResearch Mfg. Co. has contract backlog in excess of $4,000,000 for cabin supercharging and air condition equipment on Lockheed Constellations.

Former Douglas modification center at Tulsa has been taken over by AA to meet needs of airline's expansion.

Pacific Airmotive Corp. obtained 35-yr. lease on a location at Boeing Field, Seattle.

Specially-equipped Boeing B-29 established what is believed to be an endurance record for stratosphere flight by heavier-than-air craft, by staying 3 hr. 38 min. at an altitude of over 40,000 ft. during tests by company and ATSC.

AVIATION MANUFACTURING

There is hesitation on part of aircraft industry as regards acquisition of government-owned aircraft plants, due to uncertain federal policy. Only six companies have made commitments on long leases or purchases; 13 are leasing on a short-notice basis; there are 10 sales in negotiation but none closed.

Aircraft Industries Assn. will sponsor only two aircraft shows per year: One in East and one in West, none before fall of this year. It's expected that 1946 shows will be in New York and Los Angeles. Ruling is intended to protect industry from pressure for unrestricted exhibition, in varied events, that might prove an extreme drain and of minimum value.

At Washington, D. C., Dr. Harold R. Cox, of Power Jets, Ltd., and vice president of Royal Aeronautical Society, delivered Ninth Wright Brothers Lecture on occasion of anniversary of Kitty Hawk. Sponsor was Institute of Aeronautical Sciences. Speaking on topic, "British Aircraft Gas Turbines," Dr. Cox traced development of axial and centrifugal compressors in Britain.

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Except for the springs, nearly all the metal in the new Warren McArthur seats is magnesium. Magnesium alloy tube and extruded shapes form the frames and structural members. Magnesium alloy sheet is the backbone of the side panels. Even the large ash containers are of magnesium alloy. Fabrication is largely by fusion welding in an atmosphere of inert gas—a process which proved its value with magnesium in military aircraft.

The increased passenger revenue which Revere magnesium alloys are now helping produce for the airlines in this way points out a path worth exploring for passenger vehicles of all kinds. Revere can supply magnesium alloys in sheet and plate, rod and bar, extruded shapes, tube and forgings, as well as aluminum alloy tube. A Revere Technical Advisor will gladly consult with you. Call Revere.

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shrunk to about 15th or 16th in U. S., according to Aircraft Industries Assn.'s year-end statement. Bulk of present work is continuing production of a half dozen special military types, at rate of less than 200 per month.

Immediate commercial production job is reconversion of military transport planes for airline service, plus production of new planes from designs just completed when war began, and further developed in interim. Prospects are that about 1,000 military planes will be converted, continuing through summer of 1946. Douglas C-54 requires six to eight weeks to convert, at costs between $150,000 and $200,000.

Producers of lightplanes are getting into production; however, quantity output is still months away. Makers have orders for some 50,000 planes, compared with 25,000 in being in 1941, produced over preceding six years. It is estimated 1946 output will exceed 30,000 units.

AIA estimates that total 1946 aircraft production will range above $600,000,000 and perhaps up to $750,000,000, including some $500,000,000 in military orders; $125,000,000 in commercial transports; and $100,000,000 in personal aircraft. Employment in industry probably will not exceed 200,000. Nearly half of these will be skilled engineers engaged in experimental work.

Aircraft industry is asking military and Congress for a two-part program: (1) Continuously applied and long-range research, and (2) production in quantities sufficient to develop tooling, technique, and production know-how, in order that full potential of new weapons be made instantly available.

Values from millions of dollars in research, and myriad new techniques, have accrued to air transport from war. Performance improvement is near 100% in some cases, as in increase in speed from 180 mph. to 300 mph. Capacity is up from 21 seats to 50 and more; pressure cabins raise comfort level from 12,000 to 30,000 ft. Reliability, proved in war, makes transocean operation routine. Attained also are lower fuel consumption, longer airplane life, reduced maintenance. And lower fares are in prospect.

Navy officers, visiting 15 German aircraft plants, report Nazis outstanding in willingness to try unconventional products, and in design for easy production with means at hand. But this tendency to shift to new lines caused many production problems. U. S. producers are found superior in control of machined surfaces, sheet metal work, plant layout, internal transportation, use of work-handling machinery, factory organization, working conditions, etc. Report is No. 263, Office of Publications Board, Washington.

Aeronca Aircraft Corp.'s Middletown, Ohio, aircraft plant is one of latest to be offered for sale by RFC. Built at a cost of $1,142,000, plant consists of seven buildings on 2½ acres. Two of buildings are property of original lessee. Floor area is about 69,000 sq. ft.; there are numerous machine tools; 780 production equipment items; 950 portable tools. RFC, Federal Reserve Bank, Cleveland, has all data.

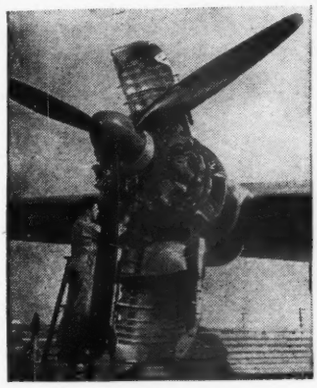
RFC and others are promoting sale of surplus aircraft engines for generation of electric power, to drive boats, and for other purposes. Engineers questioned on this subject say such applications are likely to result in failure and financial loss, and expert advice should be sought in each case of engine application.

EIGHTEEN UP

To demonstrate lifting power of YR-5A AAF helicopter, Sikorsky sent this one up carrying 18 persons—2 in cabin and 16 seated on outriggers attached to fuselage. Company flyers also performed other feats with rotary craft, such as pickup of personnel, landing on small platform, and removal and replacement of landing gear wheel while hovering. During day, five new NAA 'copter records (listed on page 134) were established by YR-5A for altitude and speed, both with and without payloads. (Press Assn. photo)

Senate War Investigating Committee, formerly called Truman Committee, was due at this writing to issue a report recommending a strong aircraft research program for peacetime. Sen. Hugh Mitchell, chairman of Committee's aviation subcommittee, has introduced legislation calling for a National Air Policy Board to promote American air power.

Though AAF's XB-42 "Mixmaster" bomber was wrecked in a crackup near Bolling Field, Washington, it was not expected at this writing that loss would affect plans of Douglas to go ahead with a commercial version of plane, to be designated DC-8.



NEW COWLS FOR CONNIE

New type of engine cowlings now being fitted to Lockheed Constellations are stated to give mechanics 2-min. access to craft's Wright Duplex Cyclones, thus cutting expensive ground handling time. Arrangement consists of four main panels, with two hinged side panels quickly removable without unfastening any hinge bolts or pins, upper and lower panels being hinged to engine nacelle's main structure. Quick opening, flush-type latches hold panels in place. When opened, sections are easily swung out of way and there are no support struts to interfere with tools or vision.

Consolidated Vultee's XB - 36, military version of civil transport model 37, designed to carry 204 passengers, will soon be ready for test flight. AAF has indicated that such bombers are capable of carrying on intercontinental warfare. Gross weight of plane is 250,000 lb., range 10,000 mi.

A bill rescinding war appropriations leaves Navy Bureau of Aeronautics with $148,000,000 for research until end of this fiscal year, which is full amount requested, and $61,000,000 more than amount approved by Budget Bureau. AAF has $200,000,000, which is $45,000,000 short of its request, but $85,000,000 more than was recommended by Budget Bureau.

Orders for military planes are going mostly to Boeing, North American, Lockheed, Grumman, Martin, Douglas, and a few others. Indications are that these old-line companies, whose war performance was outstanding, will continue as major suppliers, with decreasing emphasis on small and new-comer producers.

Legislation providing for establishment of a National Research Foundation has been revised so that, if Government eventually sponsors most scientific research, it will not become owner of most patents on new-developed aircraft and allied designs.

Controversy over question whether a powered glider is an airplane is continuing. Nelson Aircraft Corp., producer of "Bumblebee" glider, with 16 hp. auxiliary engine, believes CAA will have to draw up a new form of certificate for it.

Glenn L. Martin has nine contracts for conversion of Douglas C-54s to commercial service, totaling more than $15,000,000. As a result, about 3,000 Martin employees have been called back from furlough, and they'll probably stay on as conversion job tapers off and production of Martin 202 transports increases towards expected 40 per month in first six months of 1947. Martin expects about 14 conversion contracts in all. So far there are no orders for conversion to sleeper types.

Senate Interstate Commerce Committee has begun hearings on Mitchell Bill providing for establishment of a National Air Policy Board of nine members, according to NAA. Bill would authorize Board—frequently compared with Morrow Board that followed last war—to study and report on air transportation and its relation to national defense and other transportation.

After months of conference between interested parties, CAB has issued CAR Part .03 prescribing airworthiness requirements for non-transport aircraft. Essential provisions of Part .03 have been made public from time to time. Stalling speeds and rates of climb are liberalized. Load limit factor for non-spin types is 3.5, and 3.8 for normal types; 4.4 for utility planes, and 6 for aerobatic planes.

TRANSPORT AVIATION

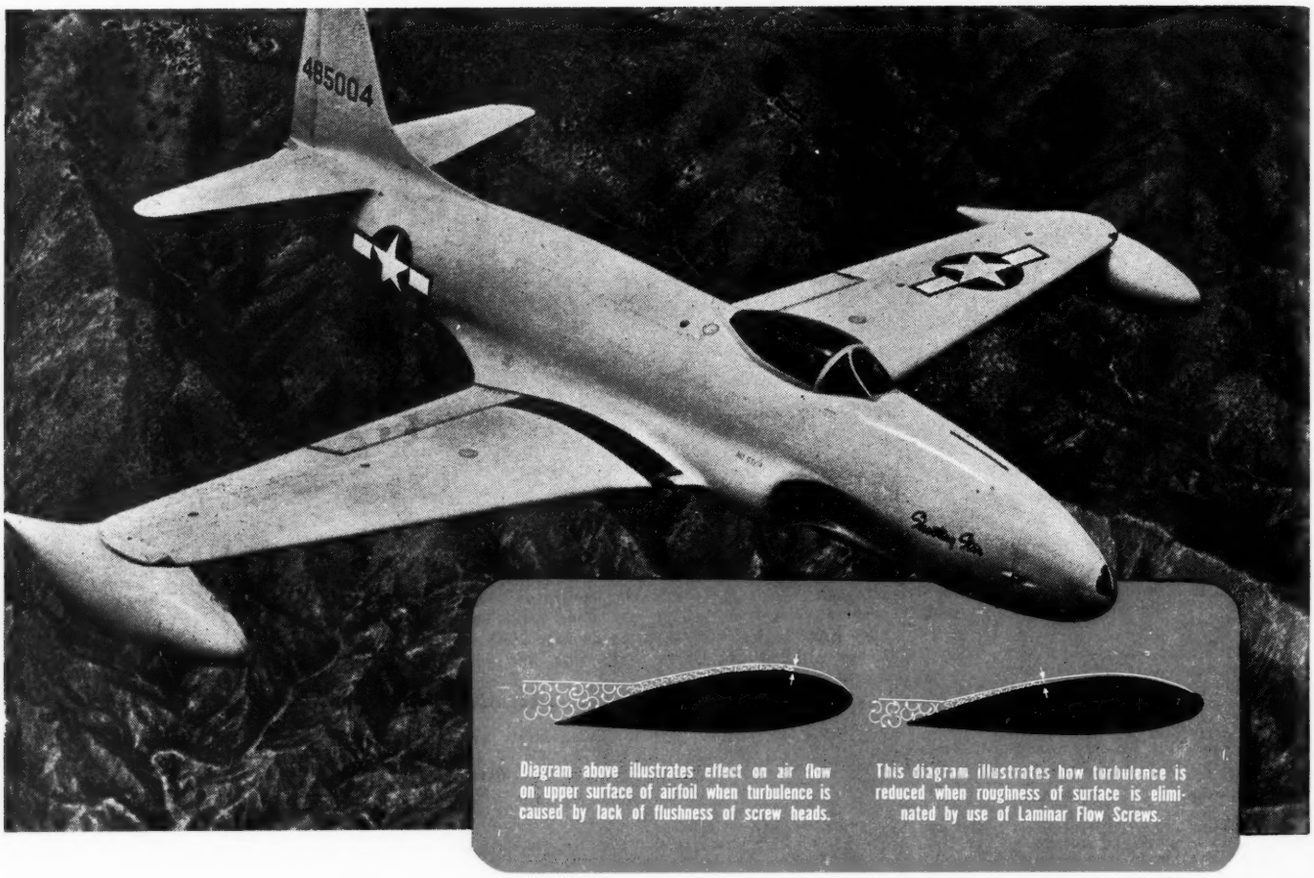
Recent confused status of trans-Atlantic airline schedules and rates has been a result of policy disagreement between Britain and United States. Following the PAA rate-cut case (page 142, Jan. AVIATION), the Atlantic Traffic Conference, of airlines of U. S., Britain, Scandinavia, Netherlands, France, and Belgium, instituted a special meeting, under auspices of International Air Transort Association, at which it was proposed to establish minimum trans-Atlantic passenger rates. But CAB declined to approve of IATA rate proposals, on ground that an Anglo-American air traffic meeting had been called for early future, at which it was hoped that U.S.-British differences would be resolved, and a permanent policy established.

Britain still holds to its stand, taken at Chicago, against "freedom of the air", and for a 50-50 division of traffic on Atlantic between the two nations. This country's position is that U. S. or any country has right to operate as many schedules as are economically feasible. British right to match United States in Atlantic schedules is fully recognized. Observers believe that adherence to Five Freedoms by additional countries is increasingly weakening British position.

Chairman L. Welch Pogue of CAB has agreed at request of President Truman to remain at his post for a year or so more. His term does not expire until Dec. 31, 1947. Since resignation of Dr. E. P. Warner, former vice chairman of Board, fears that a career politician would succeed to position have caused dissatisfaction in Board and in industry. Dr. Warner (now president of PICAO) was Board's only technical authority, and opinion freely expressed is that an engineer member is needed.

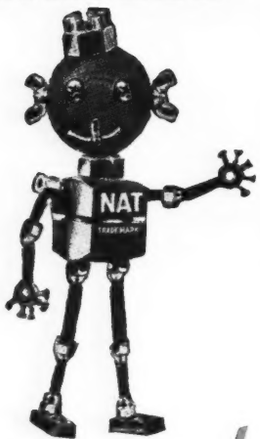
Congressman Harold C. Hagen, Minnesota, is advocating a 3¢ post card rate for airmail, also reduction of present letter mail rate from 8¢ to 5¢. Mr. Hagen quotes Postmaster General Hannegan as favoring change. Letter rate is scheduled for reduction to 6¢ within six months after end of hostilities, and Mr. Hagen believes it might as well drop other cent to five. Old proposal that all first class mail be flown in cases where time of transit would be cut is again being seriously considered.

ATA's Operations Committee has suggested a series of tests


485004
Diagram above illustrates effect on air flow on upper surface of airfoil when turbulence is caused by lack of flushness of screw heads.
This diagram illustrates how turbulence is reduced when roughness of surface is eliminated by use of Laminar Flow Screws.

WHEREVER FLUSH-HEAD SCREWS ARE USED,

LOCKHEED adopts *"Laminar Flow"*



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On exposed surfaces of fast planes, ordinary screws cause turbulence in air flow—and cut down speed. For the Lockheed Shooting Star, the trimmest and smoothest plane yet produced, "National" engineers developed true flush-head screws which have been adopted as standard by this great aircraft manufacturer.

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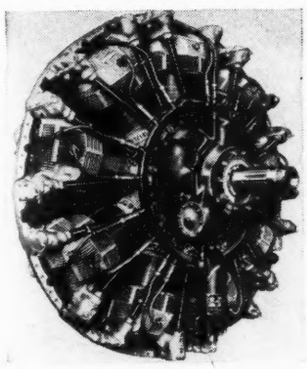
for control of off-airways traffic. Tests are being made at medium altitudes with Douglas C-54s being used by airlines for pilot training. It is recognized that positive separation will be most difficult at high altitudes, and it will not be attempted on long-range flights, except in climb to altitude. CAA recommends group of LF high-powered non-directional beacons to be used for ADF operations, and states that commercial stations will aid in this type of aviation.

Airline passenger revenue miles increased about 57% in 1945, ton-miles of express 39%. As of Dec. 15 airline fleet totaled 402 airplanes, compared with prewar total of 359. Adding 100 in overseas operations, total of 502 was expected to surpass 600 quickly, as many converted surplus planes are added. By end of 1946, according to Air Transport Assn., fleet will total more than 1,400 units, seating nearly 60,000 passengers.

Airline network increased 4,034 mi. during 1945 to 66,971, and airline personnel passed 50,000 mark. Fares were reduced to 4½¢ per mile, and basic express rates were reduced 13% as of Jan. 1. Wartime load factor hit 92% average, and is dropping off but little so far. International operations were loaded at 80%, and averaging 1,000 mi. per flight. In addition to regular operations, late in year, airlines, under contract and through seat allotments, helped to move 126,000 troops.

In reply to an overall transportation inquiry instituted by Chairman Clarence Lee of House Interstate & Foreign Commerce Committee, Air Transport Assn. is sending a statement of policy to Congress. Statement says that ATA stands for continued regulation of air transport by a special authority, and retention of barriers to air operations by surface carriers. ATA contends that policies established in Act of 1938 are as sound now as then, and that Interstate Commerce Commission, in which presumably an overall transportation authority might be centered, is not qualified to promote and regulate aviation.



LIGHTER, MORE POWERFUL WRIGHT CYCLONE

Weighing only .85 lb. of dry weight per horsepower, new Wright Cyclone 9HD develops 1,425 hp., 75 more than its immediate predecessor. Among engine's features are: Improved cooling because of new type of forged aluminum cylinder head with differential finning, added strength through use of new head, stronger power transmission parts, oil jets for increased cylinder and piston ring lubrication, high durability valves, and increased cam overlap for better detonation characteristics. An impeller inducer adds to supercharger's pressure and efficiency. Four models are planned and orders have already been received from several domestic and foreign airlines. (See specifications on page 134.)

AVIATION ABROAD

BRITAIN—Gradual change-over of British Overseas Airways from American to British equipment is expected to accelerate during coming months when first Tudors and Yorks will be delivered. BOAC's equipment was 53% British built last August, as against 41% in Dec. 1944.

It has been announced that RAF Transport Command will shortly replace many of its Douglas C-47's (Dakota's) with Junkers 52 trimotors, 240 of which are being flown to England. Latter craft is said to be able to carry greater payload.

FRANCE—Regular daily service to France by U. S. airlines is seen following signing of U. S.-French agreement covering trans-Atlantic air services. Tricolor airline, Air France, is not expected to be ready for regular service before April.

PORTUGAL—Simultaneous with arrival of three de Havilland Dragon Rapides and one Percival Proctor for Companhia de Transportes Aereos' Lisbon-Oporto route, came announcement of a British-Portuguese air agreement. Early re-inauguration of a London-Lisbon service is expected to follow.

EIRE—Government of Eire plans a parley between ten probable trans-Atlantic operators in April, officially to discuss protection of civil air services across Atlantic, and very probably to assure continued use of Irish airports.

POLAND—Russian military government recently returned 15 airports to Polish Government. This action is expected to make early inauguration of domestic Polish airlines possible.

RUSSIA—Tupolev TB-7 heavy bomber has been equipped with four jet units, and it's expected to be test-flown in near future.

INDIA—Secretary of Posts & Air of Indian Government announced recently that India plans to leave development of civil air services to private enterprise. Some form of government interest in such companies is possible, and expected.

CHINA — Chinese Government recently announced a five year plan for development of civil aviation. Program calls for some 40,000 mi. of air routes, including services to Japan, Philippines, Australia, and India.

PHILIPPINES — A new company, Far Eastern Air Transport, started operations with four surplus Douglas C-47's in November, having taken over assets of Negros-Iloilo Air Express.

AUSTRALIA—RAF service between Canada and Australia has been suspended, leaving this country without direct air connections with North America. Pan American's proposed service to Sydney is awaiting Government approval, while Australian National Airways will not be able to inaugurate its proposed service until new Douglas transports arrive in April.

GUATEMALA — Expropriation of Aerovias Nacionales, Pan American subsidiary formed to take over TACA's cancelled concessions, was approved by Guatemalan Congress. Provided was prompt compensation of company's original owners.

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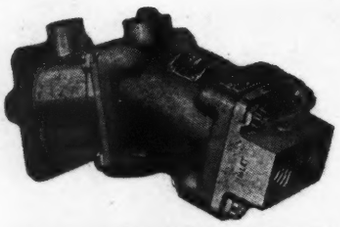
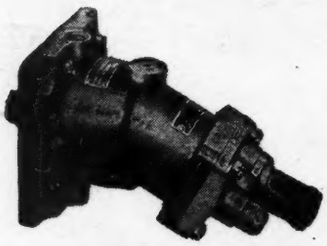


1000 PSI CONSTANT DELIVERY PISTON TYPE PUMP



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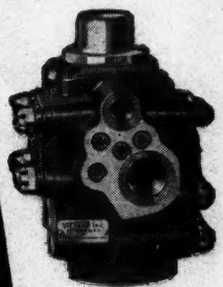

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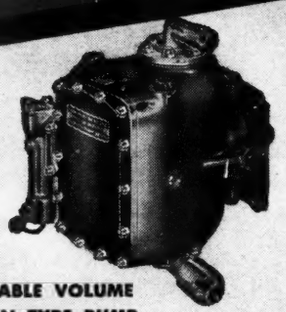
5", 7½" AND 10" ACCUMULATORS



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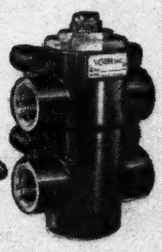

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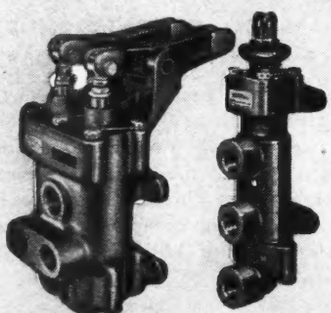

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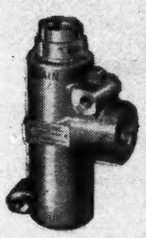

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ENGINEERING DATA

Engineering Handbook 1

Pesco Products Co., Div. Borg-Warner Corp., Cleveland, offers "Pesco Handybook," reference work for engineers, designers, draftsmen, and maintenance men. Book contains technical charts, conversion tables, tubing weights, hardness data, and much other information.—AVIATION, Feb., '46.

Electrical Heat Elements.....2

Described in booklet from **Safeway Heat Elements**, N.Y.C., is new type material for use in electrical resistance heating units. Material is combination of woven wire and yarn, described as having great flexibility and convenience of mounting.—AVIATION, Feb., '46.

Welding Chart 3

Arcos Corp., Phila., offers new 8-table reference chart on welding electrodes, including tables on corrosion resistance, weld metal surfacing data, and chemistry of weld metal. Current and voltage tables are also given.—AVIATION, Feb., '46.

PRODUCTION

Electrode Application Chart.....4

Reference guide for users of "Ampco-Trode" welding electrodes has been issued by Ampco Metals, Milwaukee. Titled "Ampco-Trode Industrial Application Chart," it contains quick information on recommended electrode grades for specific applications.—AVIATION, Feb., '46.

Electrolytic Film for Magnesium.....5

Information is available on "Manodyz" process for producing protective and decorative magnesium-oxide-silicate film on magnesium alloys. Proprietor is **Hanson-Van Winkle-Munning Co.**, Matawan, N. J. —AVIATION, Feb., '46.

Hydraulic Units 6

Completely self-contained L-type hydraulic units manufactured by **John S. Barnes Corp.**, Rockford, Ill., are described in company's Bulletin 302-U.—AVIATION, Feb., '46.

Threading Manual 7

Outstanding feature of new tap catalog and threading manual issued by **Hy-Pro Tool Co.**, New Bedford, Mass., is stated to be lubrication section covering every aspect of lubrication and tapping speeds, and serving as guide to specific lubricants. Also given is data on proper class of fit and how to use taps correctly, in addition to other technical information.—AVIATION, Feb., '46.

Electrode Selection Guide.....8

Describing approved welding procedures for each application, and giving complete data on proper electrodes for all types of work, "Arc Welding Electrodes," 32-page catalog issued by **Wilson Welder & Metals Co.**, N.Y.C., also contains chemical analysis, specifications, and other engineering data for each electrode.—AVIATION, Feb., '46.

Die Cushion Data.....9

Dayton Rogers Mfg. Co., Minneapolis, offers engineering data for figuring pneumatic die cushion size and capacity for large percentage of inclinable presses.—AVIATION, Feb., '46.

Flexible Shafting 10

Lear, Inc., Grand Rapids, Mich., is issuing reprint of article appearing in recent issue of "Product Engineering" titled "Flexible Shaft Drives—Design and Installation Data", written by Lear's electro-mechanical div. chief engineer Perfield.—AVIATION, Feb., '46.

Welding Data 11

"Guide To Everyday Welding" is 8-page booklet from **Page Steel & Wire Div. American Chain & Cable Co.**, Monessen, Pa., giving information on selection of proper electrodes or gas welding wire.—AVIATION, Feb., '46.

MACHINERY & ACCESSORIES

Sealed Motors 12

Four-page bulletin from **Crocker-Wheeler Div. Joshua Hendy Iron Works**, Ampere, N. J., describes special features of company's "Sealedpower" motor, developed for use in dusty locations or conditions of excessive moisture.—AVIATION, Feb., '46.

Hydraulic Presses 13

New 88-page publication from **Hydraulic Press Mfg Co.**, Mt. Gilead, Ohio, titled "H-P-M All-Hydraulic Presses For Modern Pressure Processing," contains history of development of company's line together with description and specifications of various press types.—AVIATION, Feb., '46.

Arc Welding Machines.....14

Air Reduction Sales Co., N.Y.C., offers new booklet on improved Wilson "Bumblebee" a.c. transformer arc welding machines, also small welders, running gear, remote control, and line of shielded arc electrodes. Engineering data and specifications are supplied.—AVIATION, Feb., '46.

Portable Conveyors 15

"Spot Conveying" is title of folder from **Island Equipment Corp.**, N.Y.C., describing company's "Power-Flex" unit system of portable conveyors for adding flexibility to movement of goods.—AVIATION, Feb., '46.

Turret Punch Press.....16

Adapted for short run piercing, Model R-5 turret punch press, made by **Wiedemann Machine Co.**, Phila., is described in Bulletin 51. Turrets with 12 stations carry variety of dies and punches, suited to requirements, and maker states any punch or die can be put into operation in 6 sec.—AVIATION, Feb., '46.

Measuring Instrument 17

Issued by **Sheffield Corp.**, Dayton, Ohio, is new catalog describing "Precisionaire," airflow gage measuring via air velocity and used in checking small and long bores to close limits.—AVIATION, Feb., '46.

AVIATION READERS' SERVICE

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FEBRUARY 1946

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NEW PRODUCTS: 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56

NAME..... TITLE.....

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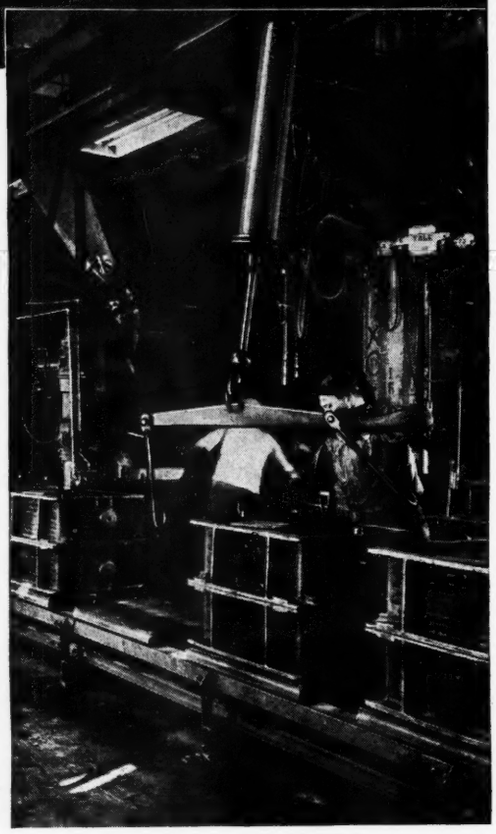

Here's another example of how Curtis Air Cylinders speed up production, make material handling easier, and save manpower for other jobs. Curtis Air Cylinders in this large foundry quickly, easily, and accurately handle heavy molds.

Curtis Air Cylinders and Air Powered Hoists are engineered to meet your individual requirements—designed to handle practically any lifting, pulling, or pushing operations—they are saving time, labor, and cutting costs in hundreds of industries today.

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Riveting Machines 18

Specifications and information on operation of line of riveting machines is contained in 6-page bulletin from **H. P. Townsend Mfg. Co.**, Hartford, Conn.—AVIATION, Feb., '46.

Thread Gages 19

Exclusive features of thread plug and thread ring gages made by **Locke Gage Co.**, Detroit, are described in 8-page catalog.—AVIATION, Feb., '46.

Steam Cleaning Unit.....20

Delivering hot vaporized cleaning solution under selective pressures up to 200 psi., new multiply duty "Oakite-Vapor" steam cleaning unit is described in 6-page folder from **Oakite Products**, N.Y.C.—AVIATION, Feb., '46.

Measuring Coating Thickness.....21

New instrument, "Filmeter", NRL Model 1, electronic device made by **American Instrument Co.**, Silver Spring, Md., for measuring thickness of paint and other coating deposited on non-magnetic base metals, is described in Bulletin No. 57-2139.—AVIATION, Feb., '46.

Hydraulic Tester 22

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We suggest you get in touch with our Detroit office for any information about controls, fittings, terminals or aircraft cable.

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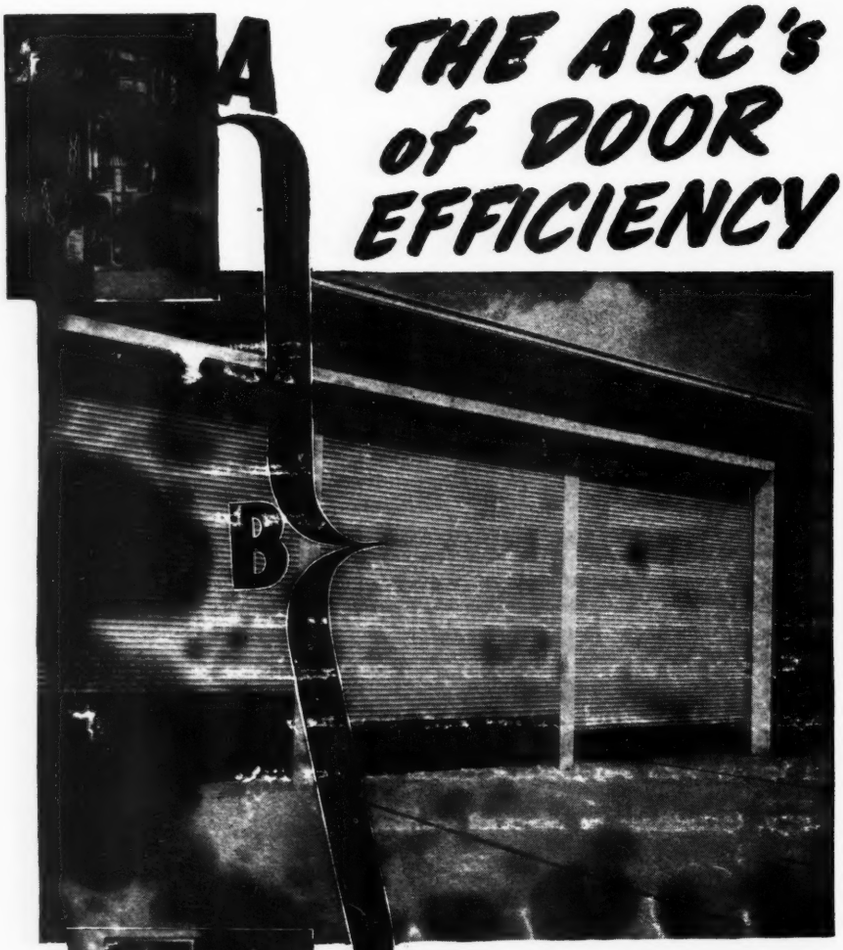
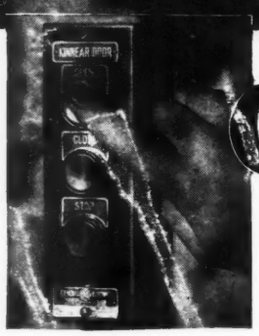
THE ABC's of DOOR EFFICIENCY





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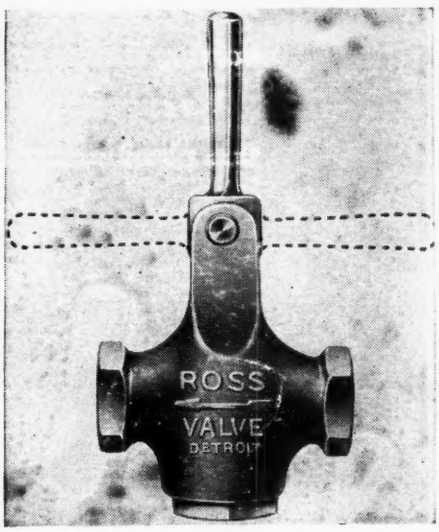

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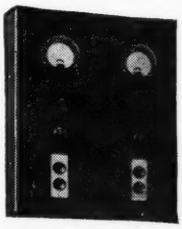
Federal's
ELECTROPLATING EQUIPMENT
will solve your plating problems

Powered by Federal's Selenium Rectifiers



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Many of our war products customers saved themselves headaches and dollars by bringing to us early, their problems of gearing and mechanical power transmissions.

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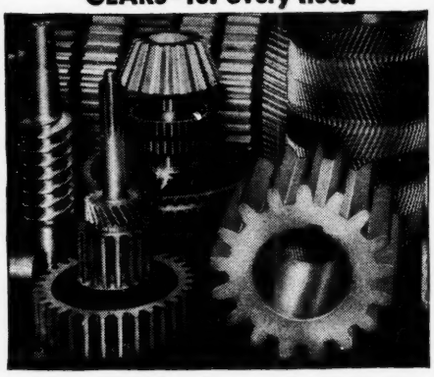

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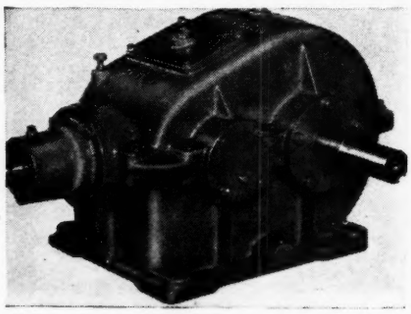

Right Angle Double Reduction Speed Reducers are available in two types—with spiral bevel gears or with worm and gear arrangement. Pacific-Western Speed Reducers are available for ratios of 2:1 to 300:1; for transmitting from fractional horsepower to 1,500 h.p., in standard units. Larger special units available upon request. Full range of sizes are available in single, double and triple reductions with single or multiple power takeoffs.

FOR ANY PART OF YOUR PRODUCT THAT HAS TO TAKE A BEATING

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WHEREVER you need greater strength and toughness, wherever you want to reduce weight or increase resistance to wear, fatigue, and shock, wherever your product must withstand high temperatures and pressures, the *right* alloy steel, properly applied, will most often answer your problem.

In U·S·S Carilloy Steels we place at your disposal the most complete line of high quality alloy steels developed to date. Aircraft Quality Steels—Bearing Steels—Creep Resisting Steels—Nitralloy Steels—Triple Alloy and Special Analysis Steels, as well as other AISI Steels. In all grades, in all finishes and treatments, and in the *widest* range of forms and sizes available anywhere.

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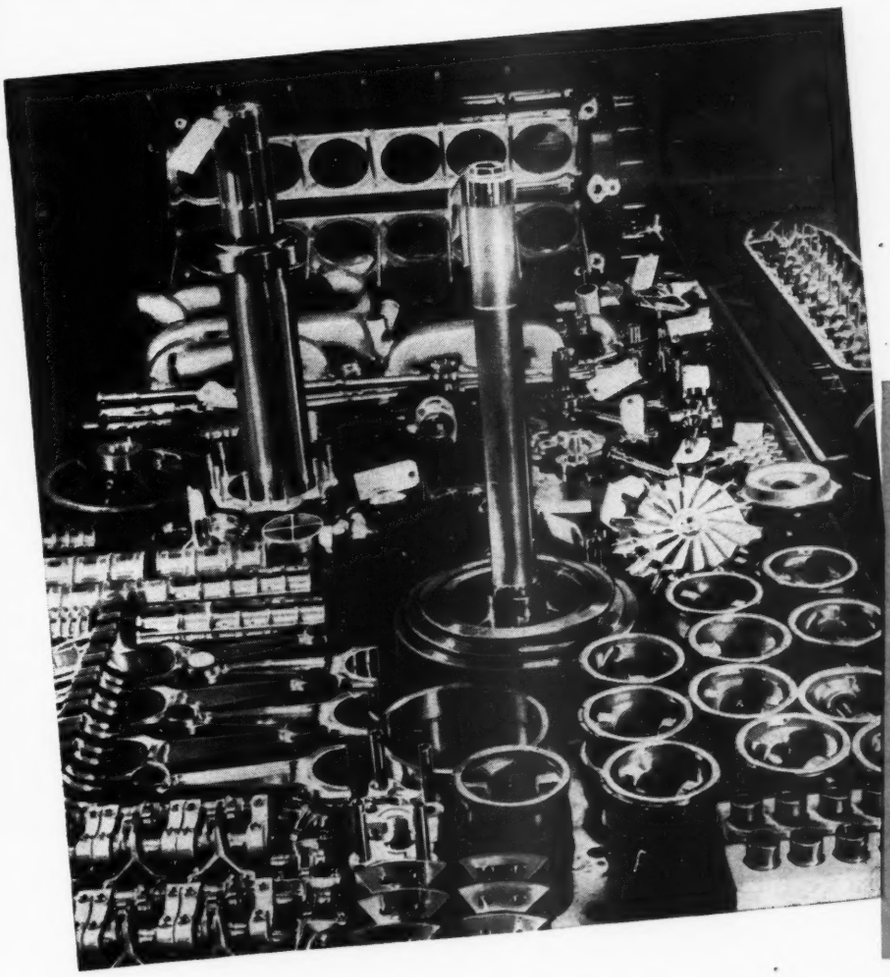
Produced both in our Chicago and Pittsburgh plants, these superior alloy steels — and the specialized metallurgical and engineering knowledge accumulated in their application—are available to give your product those qualities of greater efficiency, greater permanence and greater sales appeal, that will help to place it not merely abreast, but ahead of competition. We welcome the opportunity to work with you.



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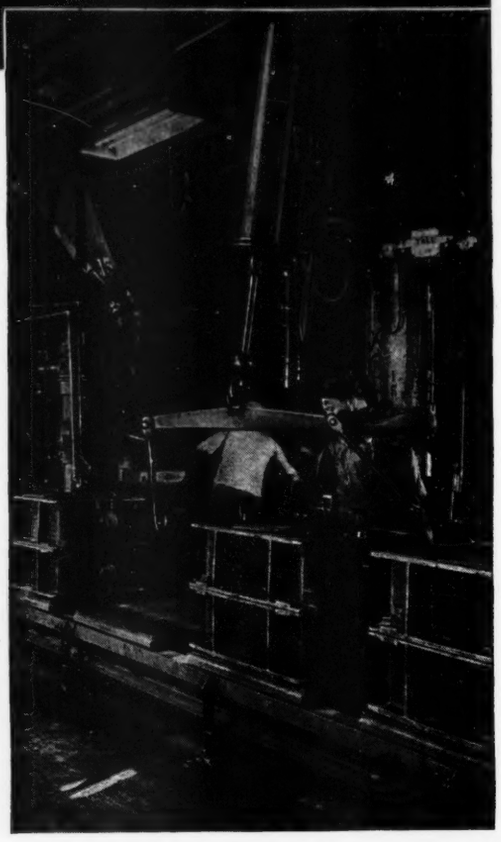
FOUNDRY *Speeds Production* ROUTINE WITH **CURTIS AIR CYLINDERS**



Here's another example of how Curtis Air Cylinders speed up production, make material handling easier, and save manpower for other jobs. Curtis Air Cylinders in this large foundry quickly, easily, and accurately handle heavy molds.

Curtis Air Cylinders and Air Powered Hoists are engineered to meet your individual requirements—designed to handle practically any lifting, pulling, or pushing operations—they are saving time, labor, and cutting costs in hundreds of industries today.

They provide exceptionally accurate control of loads, cannot be injured by overloading, and because of their simple, rugged construction, with only one moving part, they'll stand up under the heaviest kind of continuous service.

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Riveting Machines 18

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Thread Gages 19

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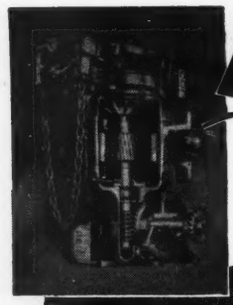

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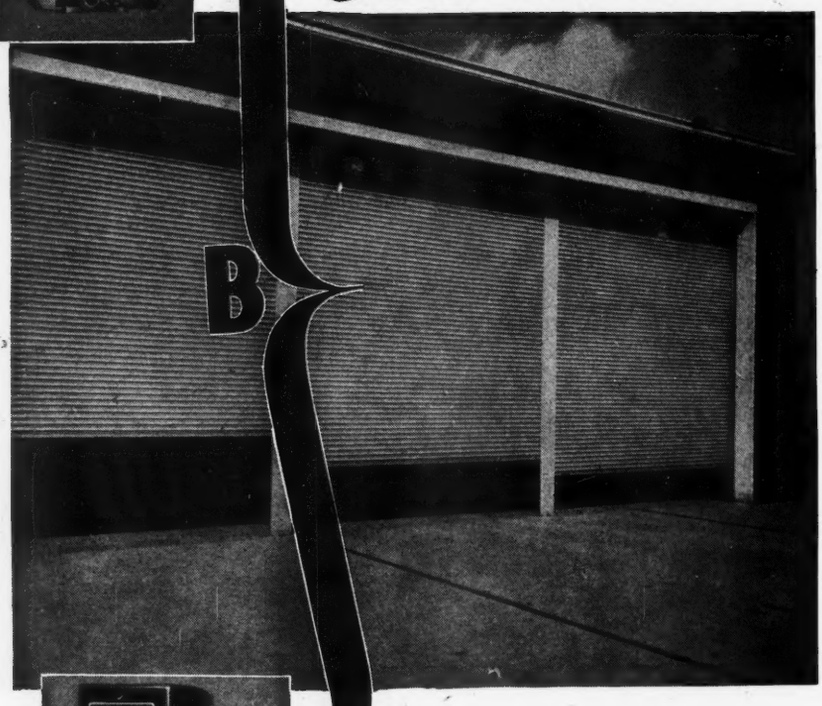

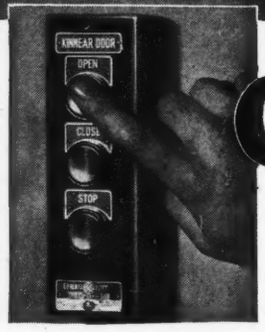

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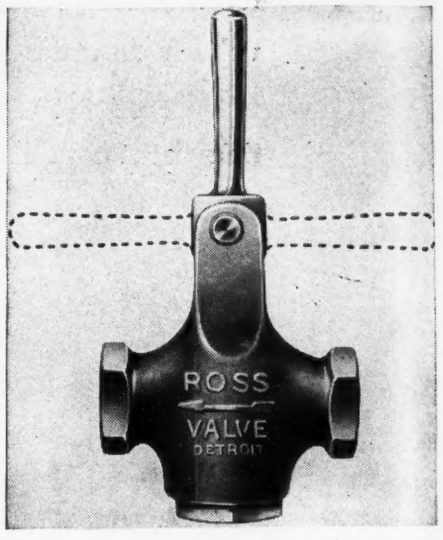

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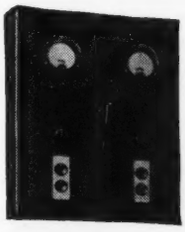

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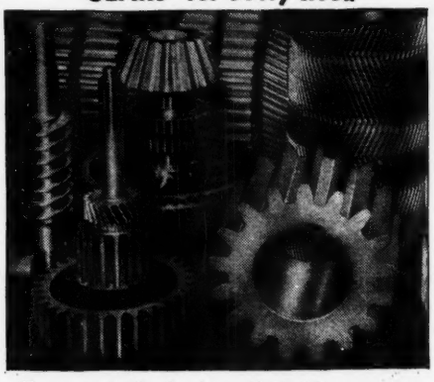

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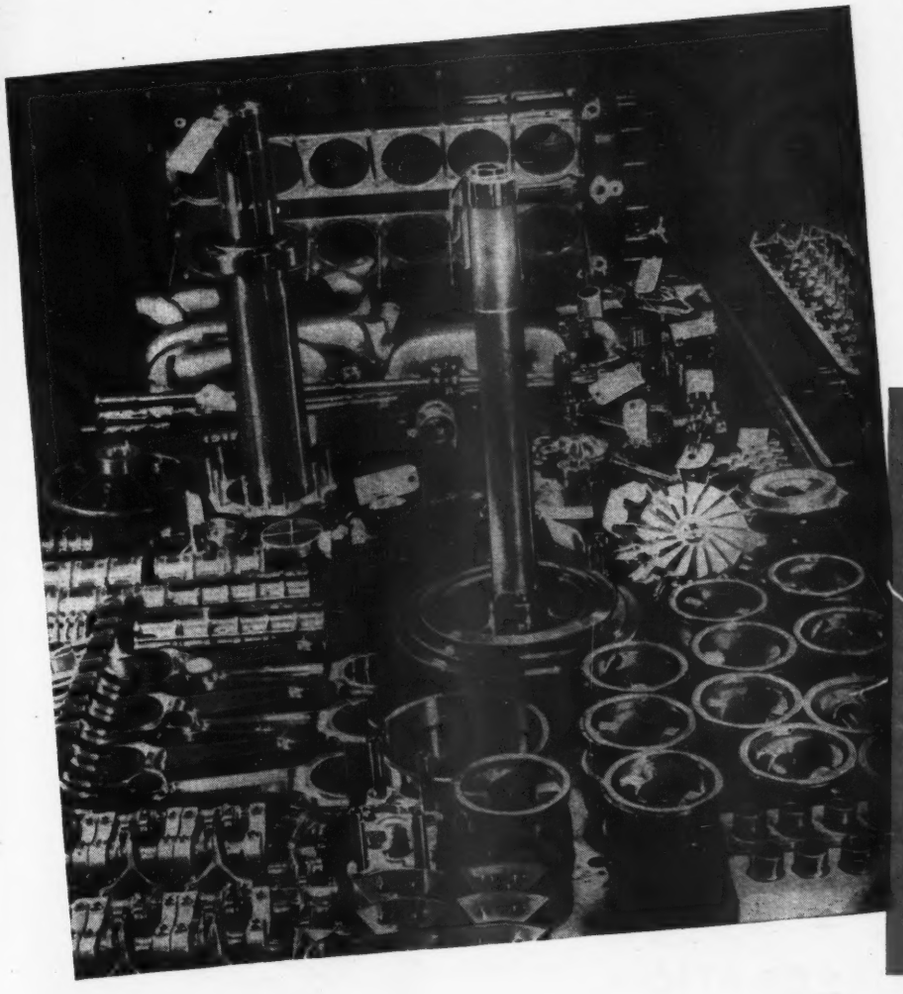
Literally millions of tons of these special purpose steels have been successfully used in critical wartime applications. Here, in the severest test that steel has ever had to face, U·S·S Carilloy Steels have done an outstanding job. They have earned a place right at the top of your list when tough postwar assignments are under consideration.

Produced both in our Chicago and Pittsburgh plants, these superior alloy steels — and the specialized metallurgical and engineering knowledge accumulated in their application—are available to give your product those qualities of greater efficiency, greater permanence and greater sales appeal, that will help to place it not merely abreast, but ahead of competition. We welcome the opportunity to work with you.



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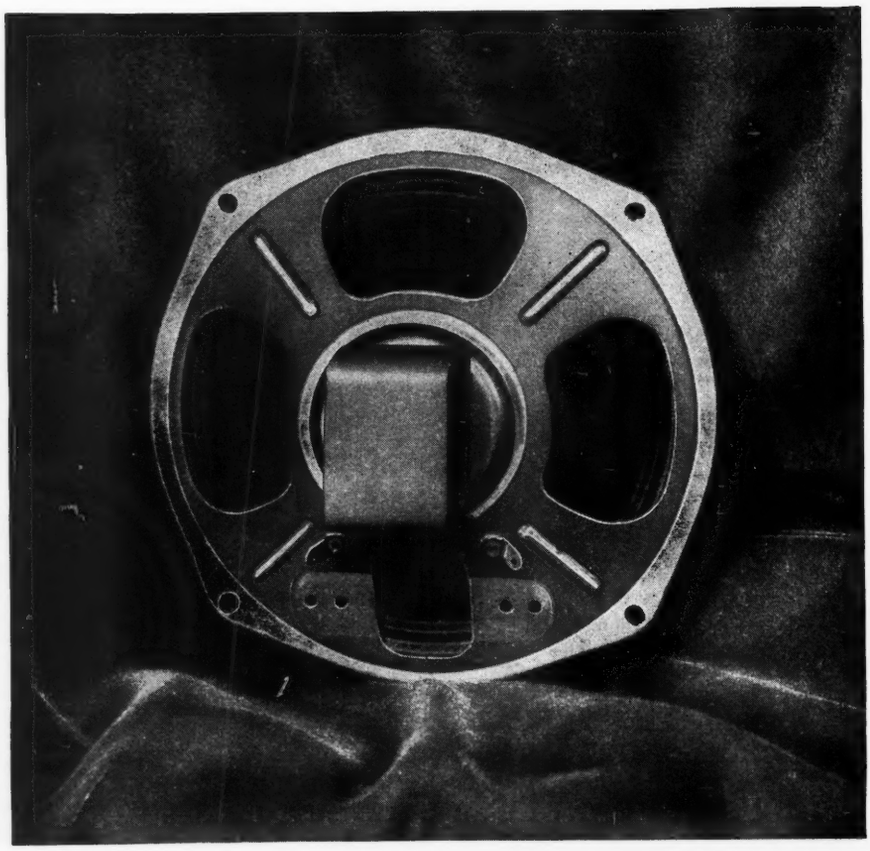

Maximum Performance with Minimum Magnet Weight!

Permoflux, with less than a 1½ ounce Alnico Five magnet weight, now achieves performance in permanent magnet dynamic speakers up to 6" obtainable only before by using a much *heavier* Alnico Five magnet.

Like other Permoflux developments that have as notably demonstrated their superiority, this new speaker design is destined to become an engineering standard wherever lightness of weight and efficient acoustical performance are important considerations.

We invite you to consider the advantages of this outstanding new Permoflux speaker development as applied to your own products.

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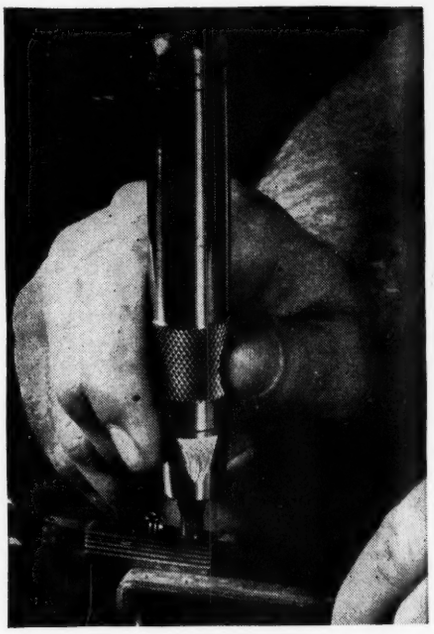
float position is easily read and tube is replaced without taking meter out of line. End fittings are universal for connections 90 deg. apart. Meter is available in sizes from 18 to 4 in., with screwed or flanged connections, and with metal tapered tube, it can be used for pressures as high as 600 psi. Meter can be obtained as simple flow rate indicator or with remote instrument for recording or recording-controlling-flow rate. Flow totalization can also be included. —AVIATION, Feb., '46.

Shop Equipment & Materials

Midget Screw Driver.....37

New Model 7000 power screw driver for small screws, made by **Aro Equipment Corp.**, Bryan, Ohio, has capacity for Nos. 1 to 6, weighs 8 oz., and is 4⅞ in. long by



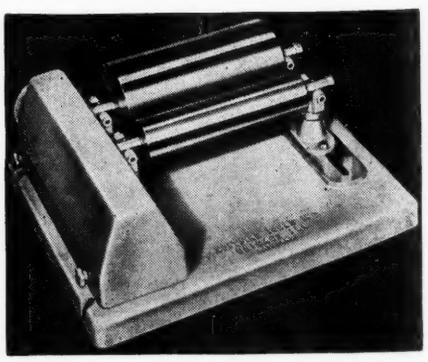
¾ in. dia. Tool is fully automatic with no manual throttle, starting when applied to work, and is available with adapter socket for nut setting. Device's air motor is rotary type.—AVIATION, Feb., '46.

Carbide Gage Blocks.....38

Tungsten-carbide gage block set of 82 pieces is announced by **Fonda Gage Co.**, Stamford, Conn.—AVIATION, Feb., '46.

Roller Lapping Machine.....39

Described as speeding up lapping and polishing around plugs, pins, or rods, new "Spitfire" lapping machine made by **Spitfire Tools**, Chicago, consists of two cast iron rollers revolving in self-aligning and adjustable bearings. Rollers are approx. 3 in. in dia. × 12 in. and 6 in. in dia. × 12 in. and rotate in same direction at same rpm. After grinding to within .0002 to



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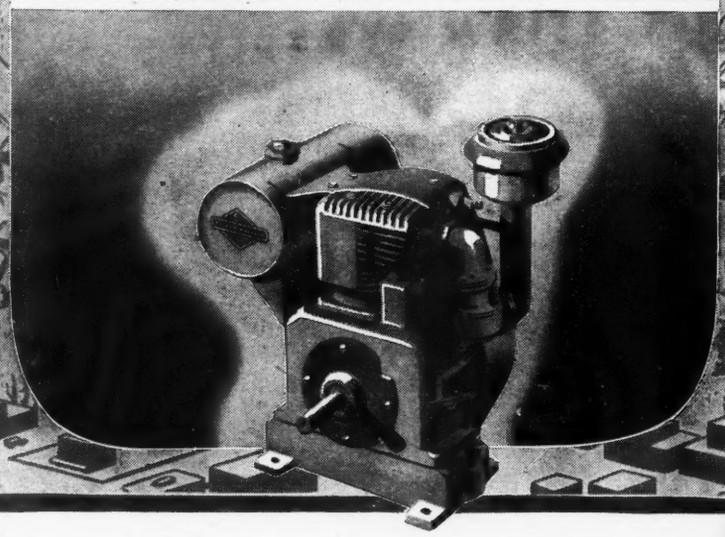

Manufacturers, dealers and users of gasoline powered appliances, farm machinery and industrial equipment know from experience that it pays to power with Briggs & Stratton 4-cycle, air-cooled engines. Over two and one quarter million of these engines have demonstrated their ability to deliver dependable power under all operating conditions. Specify Briggs & Stratton engines and you are assured of the "right power" for your equipment.

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Air-Cooled Power

4 CYCLE
BRIGGS & STRATTON
GASOLINE ENGINES

.0004 in. of desired size, abrasive compound is placed on rollers, work placed between, and notched fiber stick pressed down and moved slowly and evenly from side-to-side across pin or plug. Friction of rollers on part causes it to revolve, and difference in surface speed of rollers brings about lapping or polishing action. No chucks are used, and work may be put in, or removed for checking, without stopping machine.—**AVIATION, Feb., '46.**

Pneumatic Tool Lubricator.....40

Designed to prolong life of pneumatic equipment, prevent freezing of air operated devices, and deter corrosion, "Filter-Lube" filtering unit and lubricator has been developed by **CCA Products Engineering,** Glendale, Cal. Device, fully automatic, is mounted close to equipment, has transparent plastic oil reservoir with needle valve oil regulator, and lower element is composed of sludge basin and all-wool felt filter media.—**AVIATION, Feb., '46.**

Pocket Tester 41

Featuring six testing instruments in single metal case, Model 448 pocket "Multitester" made by **Radio City Products Co.,** N.Y.C., has 3-in.-sq. meter with movement of 200 micro-amp. and sensitivity of 5,000 ohm per v. Instruments are, d.c., a.c., and

output voltmeters, d.c. milliammeter; ohmmeter; and decibel meter, with Db range calibrated for line of 500-ohm impedance. For lines of other impedance, correction charts are supplied. Multitester, measuring 5⅞ × 3 1/16 × 2½ in., weighs 1¾ lb.—**AVIATION, Feb., '46.**

Magnesium Floor Truck.....42

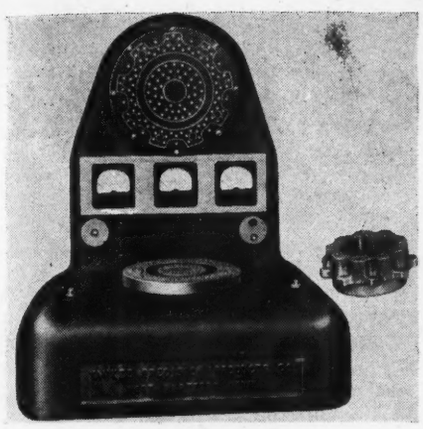
With 6,000-lb. capacity and weighing 103 lb. less than similar unit in steel, new magnesium floor truck is announced by **Service Caster & Truck Div. Domestic Industries,** Albion, Mich.—**AVIATION, Feb., '46.**

Grinding Wheel Dresser.....43

Designed for use on centerless type wheels, new crush-type multi-wheel dresser made by **Mechanical Wheel Dresser Co.,** Detroit, is stated to provide fast cutting characteristic to grinding wheel by producing more sharp, natural cutting edges.—**AVIATION, Feb., '46.**

Electric Surface Gage.....44

New type of automatic visual indicating electric surface gage for measuring flatness of machined surfaces consists of work table with surface formed of closely spaced rest buttons, arranged to duplicate form and area of part to be gaged. Each button is connected to small light bulb placed in matching position in duplicate of gage face mounted above work table. Work is placed



on gage surface and if perfect, all bulbs light, imperfections being indicated by unlighted bulbs and percentage of inaccuracy on electric meter. Equipment is built to meet requirements. Maker is **Yankee Precision Products,** Hartford, Conn.—**AVIATION, Feb., '46.**

Small Tool Demagnetizer 45

Screwdrivers, files, drills, tool bits and other small tools may be demagnetized by new demagnetizer developed by **Grayhill,** Chicago. Unit, 3 × 1¾ × ¾ in., operates from 115v. a.c. Operation of switch button energizes and de-energizes coil. Device will also magnetize objects.—**AVIATION, Feb., '46.**

Drafting Pencil 46

Draftsman's No. 3583 refillable pencil made by **Charles Bruning Co.,** Chicago, has new type clutch to hold lead firmly in non-slip rubber grip that prevents nicking and scoring of lead. Long barrel permits any full length standard drafting lead, and grip is knurled.—**AVIATION, Feb., '46.**

Electrical Appliances

Signal Generator 47

Covering range from 400 kc. to 60 mc. in 6 steps, new high-level r-f signal generator made by **Barker & Williamson,** Upper Darby, Pa., offers optional modulation of 30% at 1,000 cps. by panel switch. Output is 8v. (rms.) at all frequencies and is read direct from panel voltmeter. Output is through output jack and coaxial cable terminated in a 75-ohm resistive load. Six ranges are 400 kc.-1,000 kc.; 1,000 kc.-2,500 kc.; 2,500 kc.-6 mc.; 6 mc.-13 mc.; 13 mc.-28 mc.; and 28 mc.-60 mc. **AVIATION, Feb., '46.**

Terminal Block 48

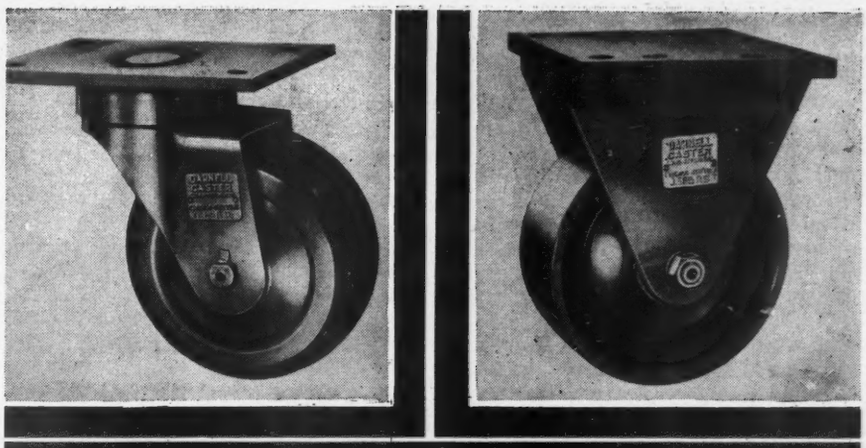
Designed to save space, new Type M terminal block has been developed by **Curtis Development & Mfg. Co.,** Chicago. From 1 to 24 terminals may be assembled and held in metal channel. Screw holes are not drilled through block, base becoming one solid insulator adjoining metal channel. Mounting holes are in channel (one in each end) thus eliminating chance of damage.—**AVIATION, Feb., '46.**

Reversing Contactor 49

Designed for use with polyphase motors up to 1 hp., single-phase motors up to ¾ hp., and voltages (a.c.) from 110 to 600, Type 135CXX heavy duty reversing contactor, made by **Struthers-Dunn,** Phila., measures 5¾ × 4 × 1⅞ in., weighs approx. 2½ lb., and consists of two 3-pole contactors mechanically interlocked. Frame structure solid single piece, and interchangeable contacts, terminals, and coil leads are accessible from front without removal of any parts.—**AVIATION, Feb., '46.**

Electrical Connector Tool.....50

High speed production is stated as principal feature of new bench-mounted pneumatic tool for installing "Hydent" connectors on electrical wire and cable. Made



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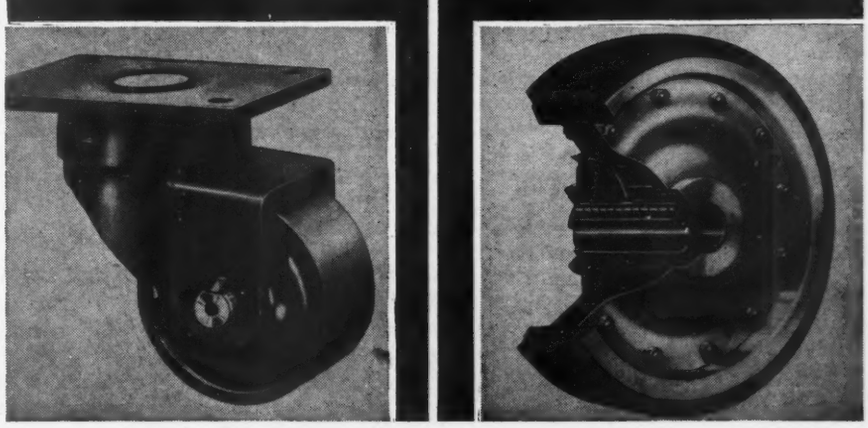

from the CARDOX case record...

Out of actual on-the-job fire experience comes evidence that Cardox Fire Extinguishing Systems provide a scope of carbon dioxide performance... and standard of effectiveness . . . far beyond the generally recognized advantages of this fast acting, non-damaging, economical extinguishing medium.

File No. S-65, covering an investigator's report on Cardox extinguishment of an oil reclamation plant fire, offers an interesting example of Cardox protection by total flooding . . . one of the many types of protection made most effective by Cardox methods of controlling and applying carbon dioxide:

"Officials of the company were highly pleased with the speed and effectiveness of the Cardox System in extinguishing a fire in the company's big *Oil Reclamation Room*—one of nine rooms and a long pipe tunnel protected by this Cardox System.

"The fire was caused by the overheating of a refining unit, causing the oil to boil over. This oil, which has a 450° F. flash point, was estimated to be at 550° F. when it boiled over. It immediately burst into flame, creating a large, hot fire.

"However, the thermostat immediately actuated the Cardox System. Approximately 5½ tons of Cardox CO_2 were released . . . instantly extinguishing the fire, and totally flooding the room with carbon dioxide. The only evidence of the fire was the paint burned off the refining unit in which the blaze originated. Normal operations were resumed in less than one hour."

The danger spots in your plant may not be similar to the one described in File S-65. But, if they involve flammable liquids, electrical equipment or hazardous manufacturing operations, Cardox offers a new scope of protection you should investigate. By increasing the performance effectiveness of carbon dioxide . . . by making it practicably available in a single system for use in *tons* for large fires or *pounds* for small ones, with ample reserve for new emergencies . . . Cardox has set new high standards of protection for many of the most severe hazards in American Industry.

An analysis of your fire hazards by Cardox Research Division and Engineering Staff puts you under no obligation. Write for Bulletin 326.

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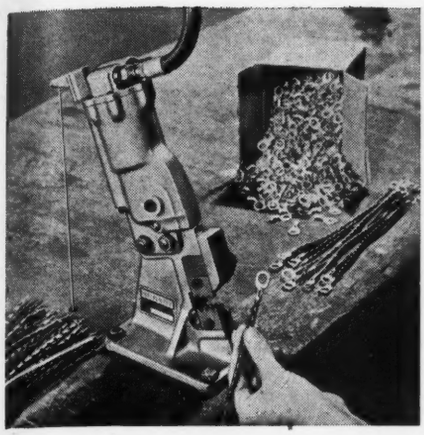
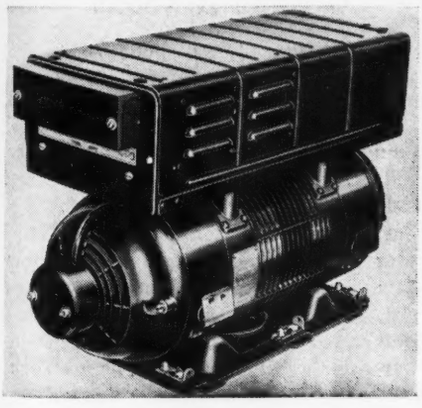


by **Burndy Engineering Co.**, N.Y.C., "Hypress" completes connection with single automatically controlled stroke. Dies now available for wire and cable sizes 22 to 10. —AVIATION, Feb., '46.

Aircraft Parts & Field Units

Inverters 51

Use of lightweight metals, simplified design, and elimination of heavy cables and electrical connections are stated to have enabled production of more compact inverters, manufactured by **Jack & Heintz**, Cleveland. This 2,500 v.a. unit provides continuous source of 400c., 115v. power for use in aircraft applications, particularly radar. Unit is of motor-generator two-bearing type, with control box. Motor is 4-pole, shunt machine, with series field for quick starting with low current, and has two interpole windings. Six-pole alternator field is equipped with amortisseur windings. Aluminum and

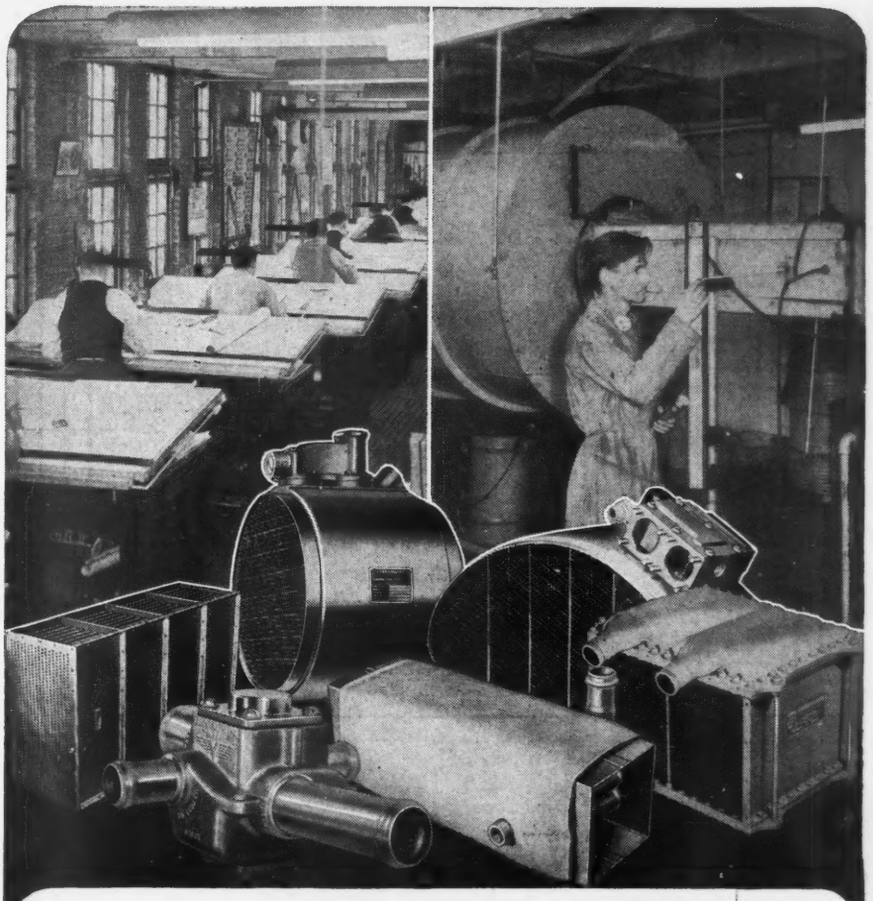


magnesium parts are corrosion-protected by phosphatizing or dichromating before painting and windings are double vacuum impregnated and baked. Mixed flow fans are mounted on each end of rotor shaft, airflow from each fan separately cooling a.c. and d.c. sections. Armature unit is mounted on high speed, permanently grease-packed ball bearings, and is dynamically balanced. Relays are provided for starting and running, starting operation is automatic, and series field is shunted out when operational speed is attained. Output voltage is controlled by carbon pile regulator. Filters are installed in control box.—AVIATION, Feb., '46.

Hydraulic Valve 52

New 4-way hydraulic valve made by **Geroter May Corp.**, Logansport, Ind., incorporates "Floating Piston" design to permit close fitting of piston in valve bore and give maximum sealing ability. Valve stem is supported in its bearings in valve covers without influence on piston fit in valve body. Minimum leakage is also insured by

YOUNG ENGINEERED
From Start to Finish



From research and drafting board to final installation, each Young Heat Transfer Product is laboratory tested, and also tested under severest conditions of use, before it is released for production. In the fields of military, civil and commercial aviation, Young engineers are called upon to design aeronautical heat transfer equipment for special cooling problems. A few of these Young contributions are grouped above. Each has been designed and engineered for highly specialized application, resulting in maximum efficiency, more complete performance, and longer life. For answers to your routine, as well as specialized cooling problems, take advantage of Young Engineering Service today . . . without obligation.

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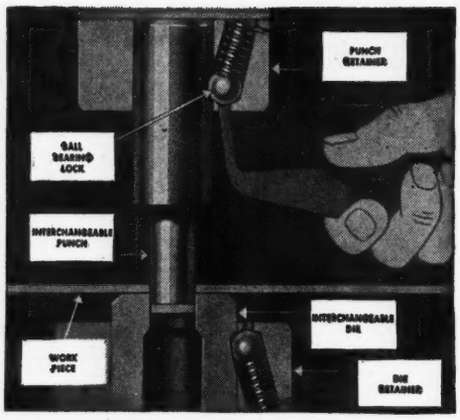

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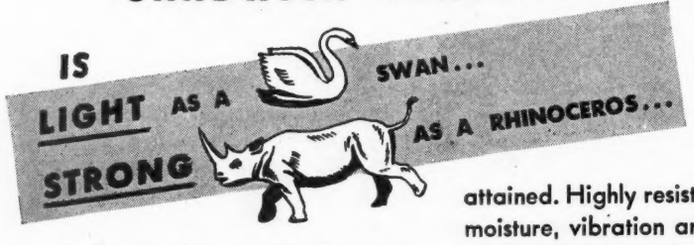
SANDWICH CONSTRUCTION



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"SKYPLY" is perfectly suited for airplane furniture and other interior equipment. In large airliners it can be used for furnishing and finishing cocktail lounges, reading rooms, game rooms, rest quarters, frozen food compartments and storage lockers.

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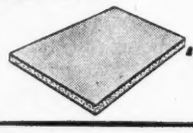


"SKYPLY"

use of "O" ring seal which prevents exhaust oil from leaking past piston stem. Valve covers are also sealed with "O" ring. —AVIATION, Feb., '46.

Runway Contact Light 53

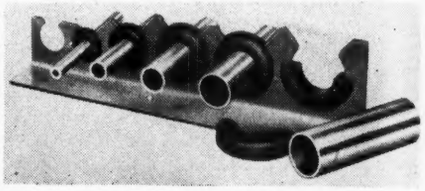
Westinghouse Electric Corp., Pittsburgh, announces new runway contact light designed to carry dead load of over 50 tons, equivalent to load imposed by 200,000-lb. craft taxiing over it. Having 1 ft. dia., light projects 2¾ in. above ground. Cantilever type frame carries load, and lens floats on rubber gaskets.—AVIATION, Feb., '46.

New Hydraulic Fluid 54

Useful as aircraft hydraulic fluids, new silicone oils developed by General Electric Co., Schenectady, are stated to flow at —121 deg. F. and may also be used at 302 deg. F. without sludging or oxidizing.—AVIATION, Feb., '46.

Fairlead 55

Comprised of two parts, new fairleads made by Double T Fairlead Co., Hawthorne,



Cal., are designed to support any combination of tubing sizes. To assemble, split grommet is placed over tubing and other half of grommet inserted.—AVIATION, Feb., '46.

Paint Reclaimer 56

Reclamation of waste paints, lacquers, and varnishes from aircraft finishing operations is purpose of new Meckler process, controlled by Meckler Chemical Corp., Cleveland. Sludge from spray booths is converted into usable finishes.—AVIATION, Feb., '46.

Canada Is Ready

(*Continued from page 79*)

spur eight-place glider; and combat and transport craft, including the Bristol Bolingbroke twin-engine bomber, Westland Lysander reconnaissance plane, Vickers Stranraer twin-engine flying boat, Hawker Hurricane, Curtiss Helldiver fighter-bomber, Convair Catalina flying boat, Noorduyn Norseman transport, DH Mosquito twin-engine fighter-bomber, Avro Lancaster and Lincoln four-engine bombers, and Avro York and Lancaster four-engine transports.

At the outbreak of war, immediate demand was for light training craft to meet initial needs of the British Commonwealth Air Training Plan. At the same time, long range production was arranged, and expansion of manufacturing facilities planned accordingly. Over $80,000,000 in capital facilities had been invested in the industry by the government, including two government-owned companies—one for production, one for coordination of the program.

As the air training plan developed, need arose for heavier training planes. Later, manufacture of trainers was gradually reduced and the production of bombers and fighting craft developed.

The '46 model has a real heat problem

GRANDMOTHER shivered with the kerosene stove going full blast. The newest, fastest jet propulsion aircraft burns the same familiar fuel—but what a difference in *heat!* The flaming gases of jet propulsion range upward from 2000°F!

Handling these gases was a problem for specialists in stainless steel—for specialists in heat and corrosion—for the specialists at Solar!

Now . . . the engineering and fabrication skills that produced exhaust systems for jet aircraft . . . are ready and waiting to tackle your problems. See Solar for cost-cutting engineering and designing with high temperature alloys. See Solar for advanced forming techniques from deep drawing to precision casting. *For quick action — write, wire or phone:* Solar, San Diego 12, California. Factories in San Diego and Des Moines, Iowa.

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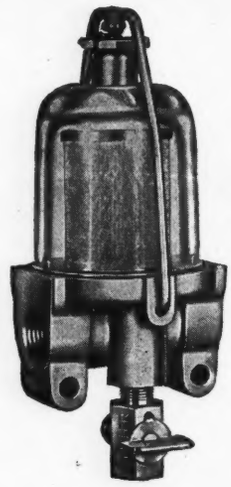
Wants your tough problems in engineering and fabricating high temperature alloy products



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A NEW FUEL STRAINERWITH EASY DRAIN FEATURES FOR THE SMALLER AIRPLANE

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In 1940, a total of 904 craft were built weighing 1,740,000 lb. without engines. In 1944 a total of 4,178 aircraft were accepted with a weight of 27,892,000 lb. (without engines).

In addition to building planes, Canada's industry also assembled craft from components shipped from Great Britain, and also bought craft in the U. S. Of major importance to the allied war effort was the production of various aircraft components in Canada—of which millions of dollars worth were made for prime contractors in the U. S. on Boeing B-29 Superfortresses and other combat planes. And Canada also supplied great quantities of wood and other raw materials for planes made in Great Britain.

To keep its more than 12,000 service and training planes in the air, Canada developed an aircraft repair and overhaul program which operated in 20 major plants, assisted by 65 smaller contractors and 50 ancillary firms. Main contractors were strategically located from coast to coast and could handle any type of plane. At one time this overhaul industry employed 18,000 men and women and occupied 2,000,000 sq. ft. of factory floor space.

As a result of the war, Canada has an aviation industry with the know-how of building a large variety of aircraft and components. Domestically it does not have the market to keep such an industry in operation in a manner approaching the wartime scale, but stimulus to aviation makes possible a peacetime industry far in excess of the prewar status. Canadian aircraft manufacturers are endeavoring to obtain governmental rulings which will make it easier to sell their products in competition with mass production aircraft in the U. S., since tariff protection often makes the price of planes too high for the private flyer. Manufacturers want to see the 8% sales tax taken off aircraft, and have also asked Ottawa to rule on standard profits for the industry, to allow some readjustment to be made on their wartime excess profits taxes, and give them a substantial refund with which to face the first few years of peacetime production.

Accessory Showplace

(*Continued from page* 154)

flexible housing and with wide variety of fittings, control is made by *Simmonds Aerocessories,* 30 Rockefeller Plaza, N. Y. 20, N. Y.

Goodrich Pneumatic De-Icers For Medium Planes

Wing and tail leading edge de-icers are now made by *B. F. Goodrich Co.* for: Beech C-18s, Grumman G-21, Lockheed 10 Electra, Lockheed 12, and all larger ships.

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MURDOCK RADIO PHONES

MURDOCK Radio Phones are built by sound manufacturing methods to give service—traditionally outlasting ordinary radio phones by years of service.

No other listening experience is like hearing through the "Ears-of-a-Nation"—produced by MURDOCK. Thousands are now listening without strain or discomfort. They get the message right . . . the first time . . . all the time!

MURDOCK Radio Phones have been a FIRST for over 40 years with unusual features that mean effective, easy listening. Be sure to consult with MURDOCK for sturdy, solid-built HEAD PHONES!

Write for Catalog

JOBBERS

MURDOCK RADIO PHONES are now available to you in greater quantities. Write us for full information.

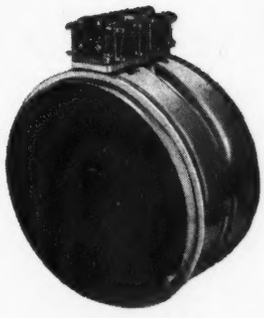
WM. J. MURDOCK CO.

198 Carter St., Chelsea 50, Mass.

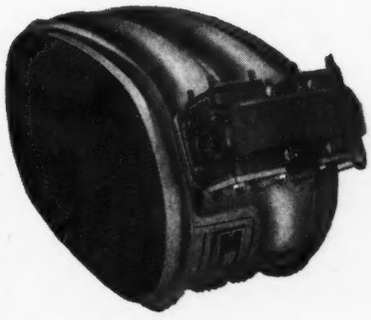
AiResearch Oil Cooling Systems

ON LEADING AIRPLANES

DOUGLAS SKYMASTER
13" Aluminum Oil Cooler. Weight 39½ lbs.



BOEING STRATOCRUISER
16" Aluminum Oil Cooler. Weight 35 lbs.



LOCKHEED CONSTELLATION
Aluminum Elliptical Oil Cooler (220 sq. in. cooling area). Weight 35 lbs.

AiResearch leadership in the aircraft oil cooling field was well established before the advent of war. So much so, that by war's end *more than half the total aircraft tonnage produced for the Army Air Forces had been equipped with AiResearch oil cooling systems.*

AiResearch was *first* to produce the thermostatically controlled oil cooler shutter, *first* to perfect the elliptical oil cooler, *first* with surge protection, *first* with electric flap control, *first* to fulfill government specifications with coolers over 16 inches in diameter and *first* to build a standard Army-Navy four port valve.

Today, AiResearch is building oil cooling systems for the mighty luxury transports of Lockheed, Douglas, Boeing and Consolidated, as well as for numerous small craft. This background of specialized research and skill in precision manufacturing is available for working out your problems. AiResearch Manufacturing Company, Los Angeles, California.

"Where Controlled Air Does the Job" **Automatic Exit Flap Control Systems • Temperature Control Systems • Engine Air Intercooling Systems • Cabin Pressure Regulating Systems • Engine Oil Cooling Systems • Supercharger Aftercooling Systems**

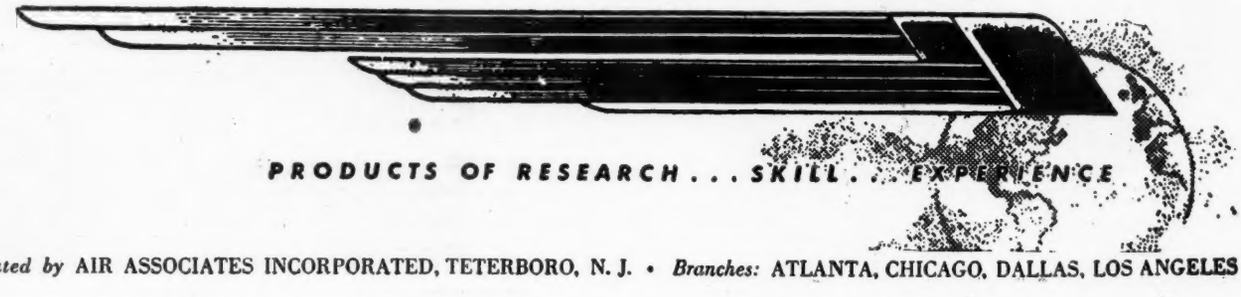
AiResearch
DIVISION OF
THE GARRETT CORPORATION

OF THE WORLD'S MOST MODERN
aircraft radio

Designed and engineered by Airadio... largest single wartime producer of radar and electronic test equipment for the United States Navy... *first* to bring you the slide rule dial... *first* to bring you a fully-powered aircraft radio *weighing less than 11 pounds* including receiver (illustrated), transmitter, and power supply. Write for particulars.

AIRADIO

INCORPORATED · STAMFORD, CONNECTICUT



PRODUCTS OF RESEARCH... SKILL... EXPERIENCE

Distributed by AIR ASSOCIATES INCORPORATED, TETERBORO, N. J. • *Branches:* ATLANTA, CHICAGO, DALLAS, LOS ANGELES

Scott Hangar-Space Saver

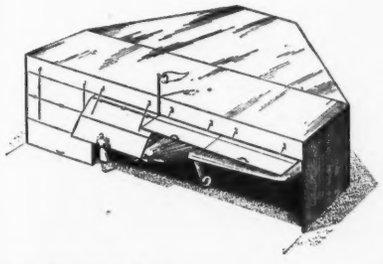
To permit hangar storage of many more lightplanes in same space, this useful caster-stow set is being marketed by *Scott Aviation Corp.*, Lancaster, N. Y. Three separate units allow device to be used with planes having widely divergent dimensions.

Small Airport Lighting System

To avoid heavy expense of underground wiring for small airport lighting, a new system has been devised and approved by CAA, using reflectors and projected light in place of wire-conducted current. Installation is combined product of *D. W. Onan & Sons*, Minneapolis (which provides the 5,000w. lighting plant) and *Minnesota Mining & Manufacturing Co.*, of same city (which makes reflectors).

Reflectors, placed along runways and outlining airport name on roof, have been proved—by CAA test at Rochester, Minn., Airport—to be visible under weather conditions when plane's landing lights failed completely to discover runway markers.

Power plant, 4-cyl. engine, and 115v., 5,000w. 60c. generator, is capable of 1,500,000 cp. output. Mounted on trailer to facilitate moving, it is water-cooled for all-weather operation.



Texas Pre-Fab V-Hangar

Built of phenolic plywood on fir studding, this hangar can be easily assembled from 22 sections comprising knock-down shipment. Upward-folding door in four sections eliminates need for track or posts, while counterbalanced construction enables it to be moved easily. "V" construction provides considerable working space at rear. Built by *General Housing Co.*, Dallas 8, Tex.

Thermo-Cousti *FIBERGLAS BLANKETS*

V-FILM is an exclusive feature of Thompson *Thermo-Cousti* Fiberglas Blankets. *TOUGH, RESILIENT, FEATHERLIGHT,* its use reduces the weight ordinarily required for septum material from .045 pounds to .007 pounds per square foot, with comparable sound attenuation and thermal insulating qualities. *V-FILM* is *WATERPROOF* and used as a backing material it withstands moisture from condensation or leaks—keeps it out of the layers of Fiberglas. *V-FILM* is unaffected by temperatures of +275° F. to —65° F. It will not support combustion.

Thermo-Cousti Fiberglas Blankets add pounds to pay loads—and still provide top efficiency insulation. Write . . .

THE H.I. THOMPSON COMPANY

Thermo-Cousti Fiberglas Blankets

1733 Cordova Street — Los Angeles 7, Calif.

STARRETT TOOLS

Help WRIGHT Make 'Em Right

These pictures taken at the *Wright Aeronautical Corporation's* plants at Paterson, N. J. and Cincinnati, Ohio, show a few of the many precision measuring and inspecting operations entrusted to Starrett Tools.

Starrett Precision Measuring Tools, Micrometers, Vernier Gages, Dial Indicators, Bevel Protractors and other Precision Measuring Tools have the lasting accuracy and dependability that inspires good work and more of it per day.

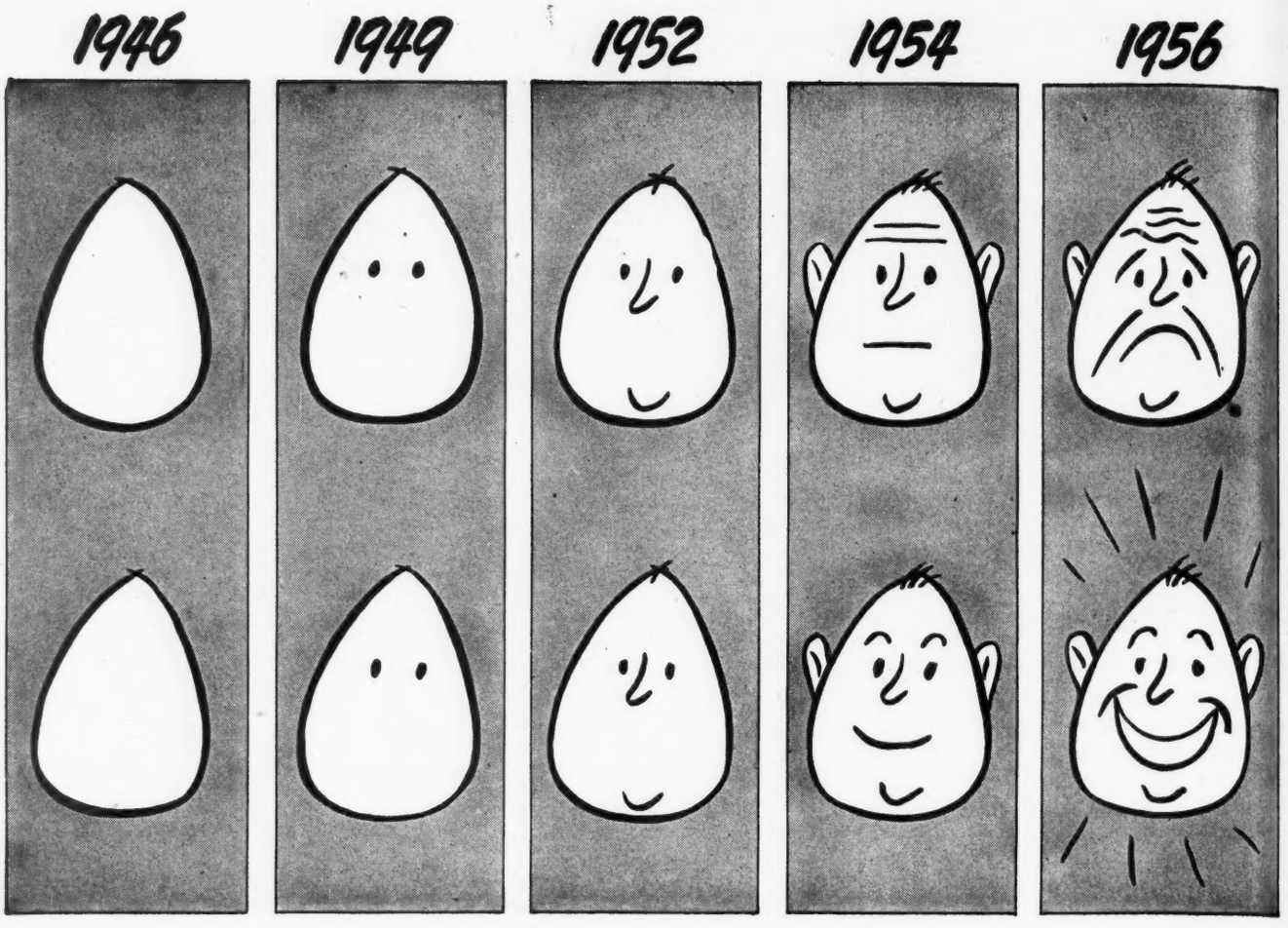
Ask your mill supply distributor to show you why "it pays to stick to Starretts".

THE L. S. STARRETT CO., Athol, Massachusetts, U.S.A.

World's Greatest Toolmakers

Precision Tools . . . Dial Indicators . . . Ground Flat Stock
Hacksaws . . . Metal Cutting Bandsaws . . . Steel Tapes

STARRETT



Two ways your face can grow in the next few years

USUALLY, our faces show what's happening to us. For instance, suppose financial matters are constantly on your mind.

Suppose you know that there's practically no cash reserve between you and trouble.

It would be surprising if your face didn't show it.

But suppose that, on the contrary, you've managed to get yourself on a pretty sound financial basis.

Suppose that you're putting aside part of everything you earn . . . that those dollars you save are busy earning *extra* dollars for you . . . that you have a nest egg and an emergency fund.

Naturally, your face will show *that*, too.

There's a simple and pretty accurate way to tell which way your face is going to go in the next few years:

If you are buying, regularly, and holding as many U. S. Savings Bonds as you can, you needn't worry.

Your face will be among the ones that wear a smile.

Buy all the Bonds you can... keep all the Bonds you buy

AVIATION

This is an official U. S. Treasury advertisement—prepared under auspices of Treasury Department and War Advertising Council

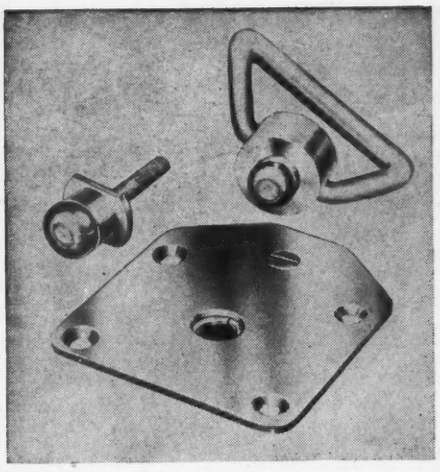
New World Standard

The claim is proved. Lockheed Constellations will bring new standards of world transportation to every country on every continent. In regular scheduled service first on these great airlines:

AMERICAN OVERSEAS AIRLINES ★ AIR FRANCE ★ ROYAL DUTCH AIR LINES (KLM) ★ NETHERLANDS INDIES AIRLINES (KNILM)
EASTERN AIR LINES ★ PAN AMERICAN WORLD AIRWAYS ★ PANAGRA ★ TRANSCONTINENTAL & WESTERN AIR (TWA)

Lockheed Constellation

Look to Lockheed for Leadership — *Years Ahead in the Science of Flight*

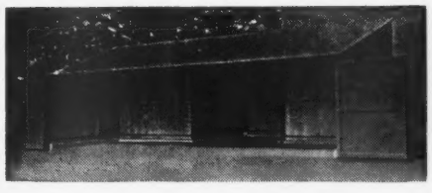


Adams Rite Wedgit

New form of quick-detachable tie-down was developed to permit separation by hand. Maker states that 40 deg. turn, by hand or with screwdriver, is all that is necessary to detach from baseplate. Capacities run from 500 to 5,000 lb. direct pull, with weights from 0.07 to 0.25 lb. per unit. Base plates can be shaped and drilled to any specification. Maker is *Adams Rite Hardware Mfg. Co.*, Glendale, Cal.

Bayley All-Metal Hangar

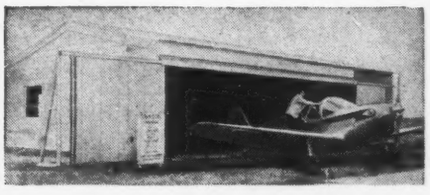
This hangar is 38 ft. wide and 24 ft. deep, built on concrete foundation with steel frame and prefab trusses. Door leaves are completely assembled,



and tracks are welded to structure. Sides and roof are clipped in place over frames, obviating drilling of bolt holes. Manufacturer is *William Bayley Co.*, Springfield, Ohio.

Stran-Steel Packaged Hangar

Hangar illustrated is a twin-unit "nest" with corner section added for use as an office. Rear of second section is seen at right, beyond door. Hangar



comes packaged, with all materials for erection on same principle as Quonset huts. Manufacturer is *Great Lakes Steel Corp., Stran-Steel Div.*, Detroit, Mich. which also builds larger hangars.

Conformity to your specifications is guaranteed by the unequalled accuracy of Booth dies.

Booth uniformity of quality and cutting will show you immediate time-savings in assembly of parts. Quality *plus* Experience is the only sure formula for complete satisfaction.

●

APPLICATION CHART AND SAMPLE KIT... ***contains swatches of S.A.E. felt types, with specification tables. Write for it. (No sales follow-up.)***

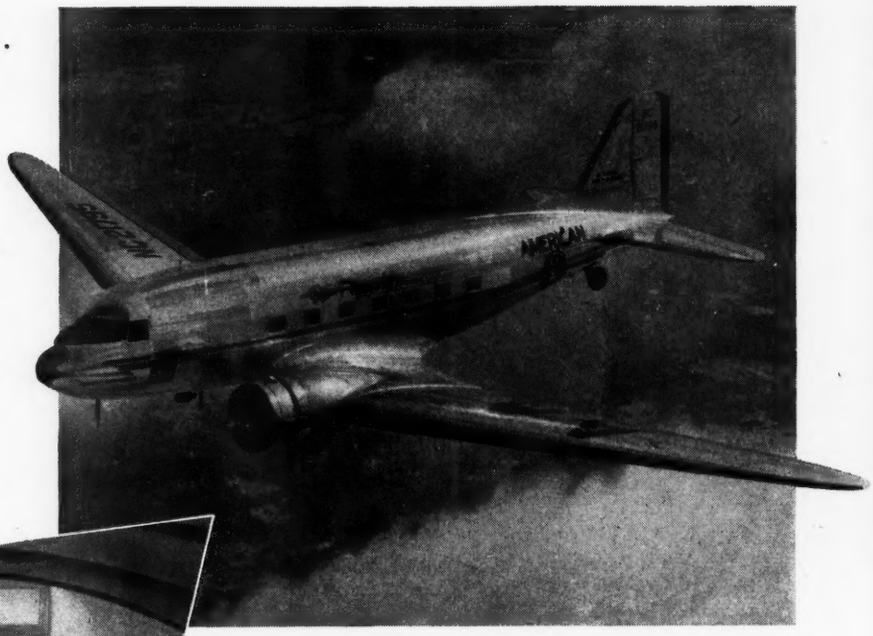
THE BOOTH FELT COMPANY
475 19th Street — **Brooklyn 15, N. Y.**
736 Sherman Street — **Chicago 5, Ill.**

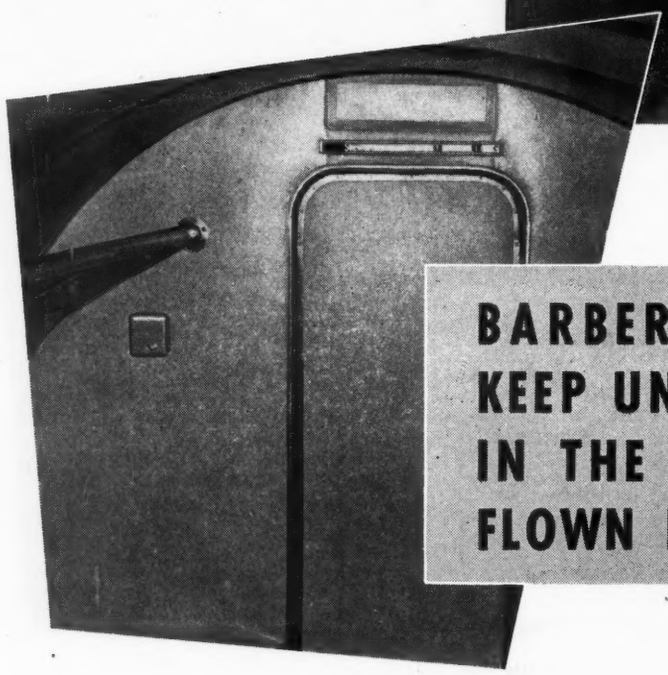
2319

Booth
TRADE MARK

PRECISION CUT FELT PARTS

This American Airlines DC-3 Flagship saw service with the AAF during the war and has now been converted for commercial use. The picture below shows the redecorated cabin with the Barber-Colman Cabin Thermostat on the forward bulkhead.





BARBER-COLMAN CONTROLS KEEP UNIFORM TEMPERATURES IN THE CABINS OF THE DC-3s FLOWN BY AMERICAN AIRLINES

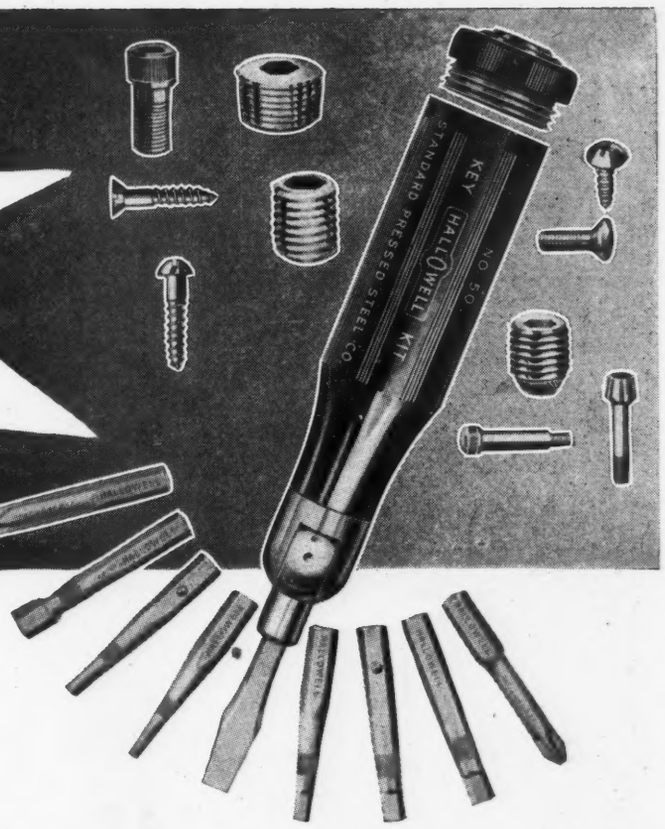
Cabin temperature control units developed by Barber-Colman especially for DC-3 conversions have been successfully installed on many of the airliners now flying again in commercial service. Only two pieces of equipment are needed — a Cabin Thermostat and a Control Motor for the heat-transfer by-pass dampers — and *their total weight is only 3 lbs. 11 oz.* By a practical application of automatic rebalancing of a bridge circuit, this system is able to achieve fully proportioning control which acts quickly and accurately without hunting. Tests show immediate response to rapid changes of outside temperature, resulting in uniform maintenance of desired cabin temperature. All Barber-Colman aircraft equipment is carefully designed and built for reliable operation. For details, write for our bulletin on Aircraft Controls.

LOOK FOR BARBER-COLMAN CONTROLS ON THE LEADING LUXURY AIRLINERS

BARBER-COLMAN COMPANY

1221 ROCK STREET, ROCKFORD, ILLINOIS

IT'S A BRIGHT IDEA



HALLOWELL KEY UNBRAKO KIT

With interchangeable bits

NEW! VERSATILE! BITS TO DRIVE ANY TYPE SCREW

Something new, something different . . . designed originally to materially simplify and improve the use of the Keys for driving our "Unbrako" socket set, and cap screws. It proved so handy, efficient and convenient, that we re-designed it for all commercial use.

The "Hallowell "Unbrako" Speed Tool Key Kit is so small, it will fit into the palm of your hand. A hollow, indestructible, black plastic handle holds an assortment of interchangeable bits that enable you to drive any type of screw. The *swivel chuck* at the end of the handle permits either the direct drive of a straight-handle screw driver, as shown, or you can snap the chuck to an angle or ell position (see small cut below), so you can drive screws that would otherwise be most difficult to reach. All bits are made of the finest alloy steel, scientifically heat treated to provide a rugged product that will give you long service.

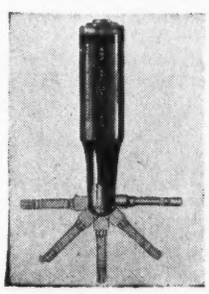


Illustration shows different positions to which swivel chuck permits bit to be swung.

Easily managed, fits comfortably in hand. Interchangeable bits are placed in hollow plastic handle.

The "Hallowell" "Unbrako" Speed Tool Key Kit is made in two sizes:

No. 25: contains seven hex, one Phillips, one slotted screw bit.

No. 50: contains six hex, two Phillips, one slotted screw bit.

If your distributor does not carry it, send his name to us, along with yours, and you will be taken care of promptly.

OVER 40 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 566 • BRANCHES: BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

Meet the Men who Make the NEW

AIR world

Magazine

Back of the facts and figures on AIR *world's* rates and circulation stands *a powerful reader interest* that is kept at top-flight pitch by these key men, leaders in today's aviation editorial know-how:

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Eminent leader in American periodical publishing for the past 20 years. Flying enthusiast and promoter of public interest in flying through such examples of generous encouragement as this magazine's current $1,500.00 Prize Contest on "The Plane I Will Buy—and Why." Publisher and Editor-in-Chief of AIR *world.*

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Edited for a BIG audience!

AIR *world* reader surveys of the past year all point to one big fact. These men are giving the thousands of AIR *world* readers *what they want* on their favorite subject—flying! AIR *world* editorially has selected and brought together a big, active, responsive audience for the aggressive advertiser who manufactures or distributes aeronautical products. It's time to get the facts on AIR *world.*

WRITE TODAY FOR A FREE COPY OF THE LATEST ISSUE AND RATE CARD

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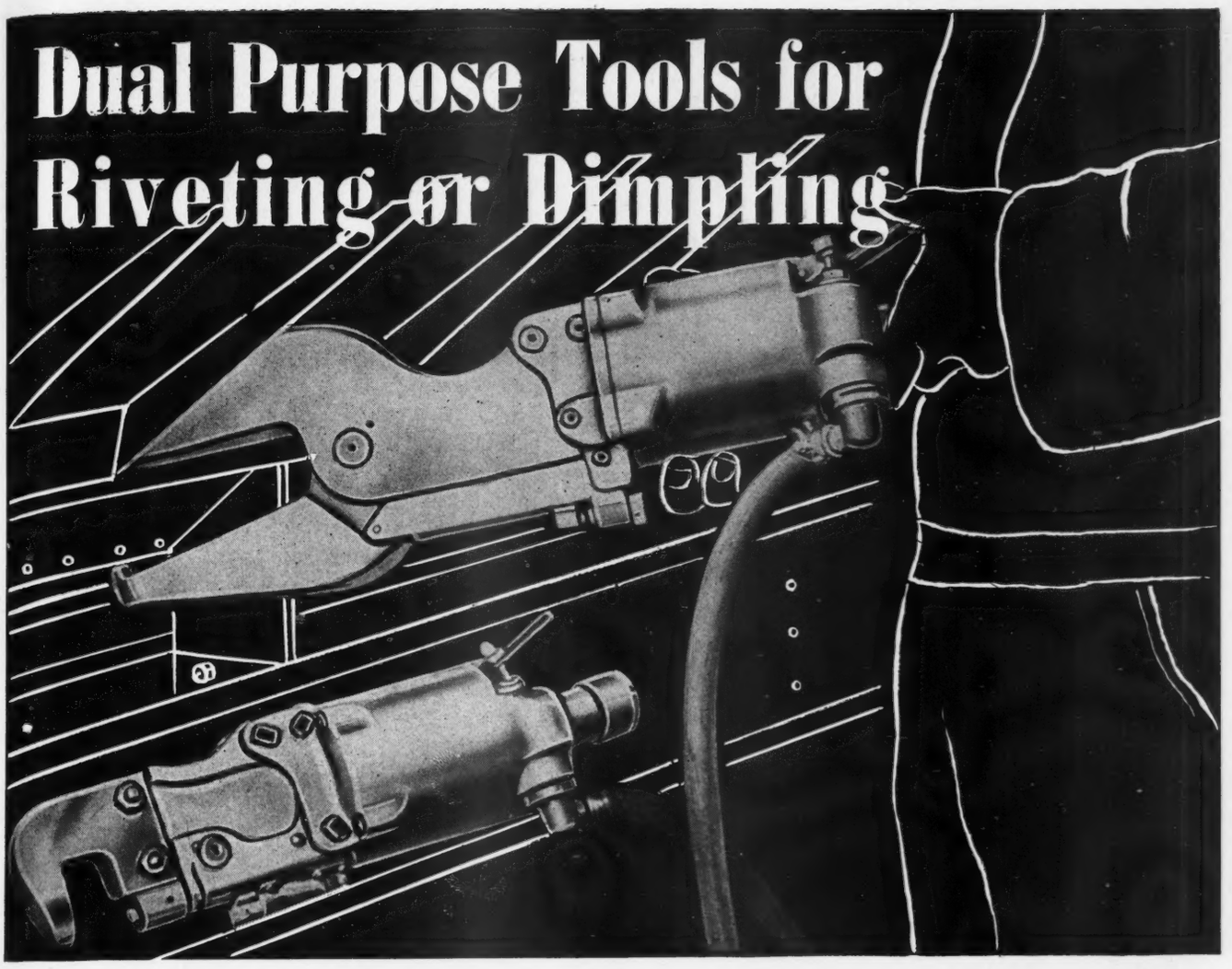
YOU ought to Read the NEW

AIR world

...OVER 100,000 OTHERS ARE READING IT!

Dual Purpose Tools for Riveting or Dimpling



CP Compression Riveters

IDEAL for fast riveting in open or close quarter work, CP Compression Riveters assure strong, uniform rivet heads with a single stroke. Speed and compressive force delivered are adjustable through "feather touch" throttle control. Equipped with "C" type yokes, CP Compression Riveters make equally efficient dimplers.

Chicago Pneumatic Compression Riveters — Dimplers are available with yokes of various shapes, sizes, reaches and gaps to meet any requirement within capacity of the riveters.

CP offers the most extensive line of portable, semi-portable and stationary Air, Pneudraulic and Hydraulic Compression Riveters covering the entire range of the aircraft industry. CP equipment is also available for driving Goodrich, Huck and other blind rivets.

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PNEUMATIC TOOLS
ELECTRIC TOOLS
HYDRAULIC TOOLS
ROCK DRILLS

CHICAGO PNEUMATIC
TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

★★★★★★★★★
AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
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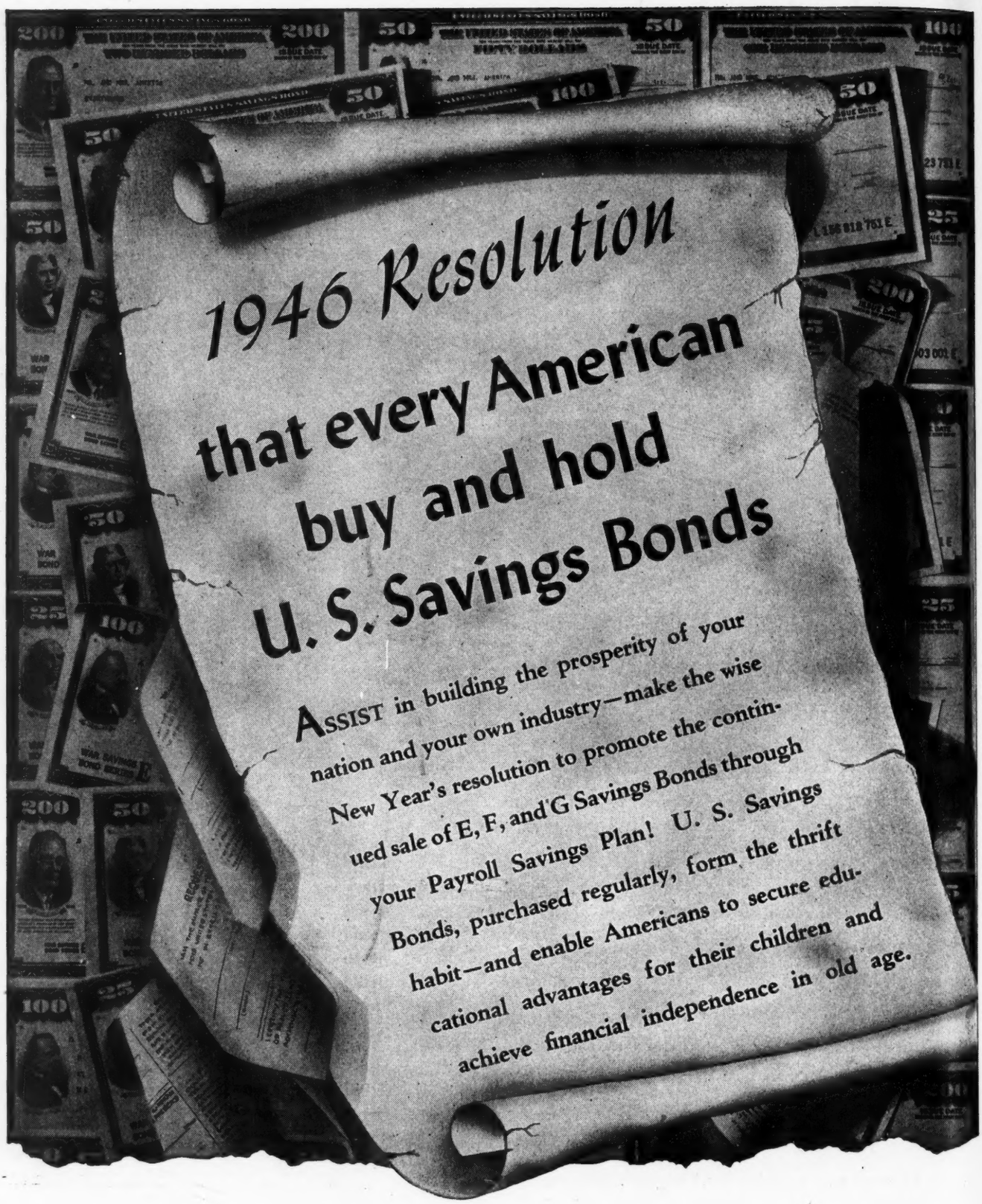

1946 Resolution
that every American
buy and hold
U. S. Savings Bonds
ASSIST in building the prosperity of your nation and your own industry—make the wise New Year's resolution to promote the continued sale of E, F, and G Savings Bonds through your Payroll Savings Plan! U. S. Savings Bonds, purchased regularly, form the thrift habit—and enable Americans to secure educational advantages for their children and achieve financial independence in old age.

The Treasury Department acknowledges with appreciation the publication of this message by

AVIATION

This is an official U.S. Treasury advertisement prepared under the auspices of the Treasury Department and War Advertising Council

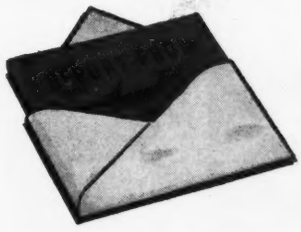
Flight 5 and the helpful ghost

Shrouded in heavy fog, darkness and a beating rain—most flights cancelled. Take-off blind under such conditions is too great a hazard. Instrument lag and pilot reaction together amount to seconds . . . critical seconds badly needed for safety margin.

But there down the runway comes Flight 5—a ghost of whitish vapor swirling out behind her. She's run about 1500 feet. Suddenly the big plane rises sharply—with AeroJet take-off assistance—*a thousand feet sooner* than usual! Up and away, long before required . . . and carrying a heavier payload, too.

Interested in jet-assistance for your operation? Then write AeroJet today for information you've been wanting. It's in the factual booklet, "Report from AeroJet."

Send today for your FREE copy of "Report from AeroJet"—a factual story of immediate and vital interest to everyone in aviation.



AeroJet Engineering Corporation
285 West Colorado Boulevard
Pasadena, California

With Jet Assistance: Civil Air Regulations Take off Flight Path—2587 Ft.
Without Jet Assistance: Civil Air Regulations Take off Flight Path—4000 Ft.

DC-3 Analysis as Described in "Report from AeroJet"

THE POWER OF THE ... Aerojet

AEROJET ENGINEERING CORPORATION • AFFILIATE OF THE GENERAL TIRE & RUBBER CO

70%

TIME SAVINGS

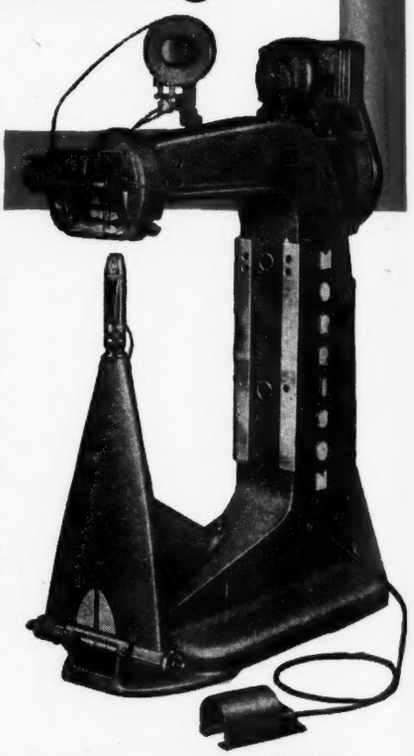
with MORRISON *Metal Stitching*

MODEL SJX
25" THROAT
ARM STITCHER

MAYBE your post-war plans include automotive, refrigeration or heating and ventilating equipment. Possibly you are going to make prefabricated houses, washing machines, furniture, farm implements, luggage, aircraft or *any* products involving fastening problems.

If so, that's where it pays to investigate Metal Stitching as done the Morrison way. These heavy-duty machines effect as much as 70% time savings in assembling steel, aluminum, stainless steel, or other metals. They also fasten woods, fabrics, rubber, plastics or other composition materials to metal or in any combination. Why not get the facts about Morrison Metal Stitching at once! Use the coupon below.

We also manufacture a complete line of book, container and steel stitchers. Sales and Service Representatives in all principal cities in the United States and Canada.



MODEL SJY
25" THROAT
POST STITCHER

MORRISON

PRODUCTS OF THE SEYBOLD DIVISION
HARRIS-SEYBOLD-POTTER COMPANY
DAYTON F7, OHIO

STITCHERS

ARMY E NAVY

HARRIS-SEYBOLD-POTTER CO., Dept. A-105
819 Washington Street, Dayton, F-7, Ohio

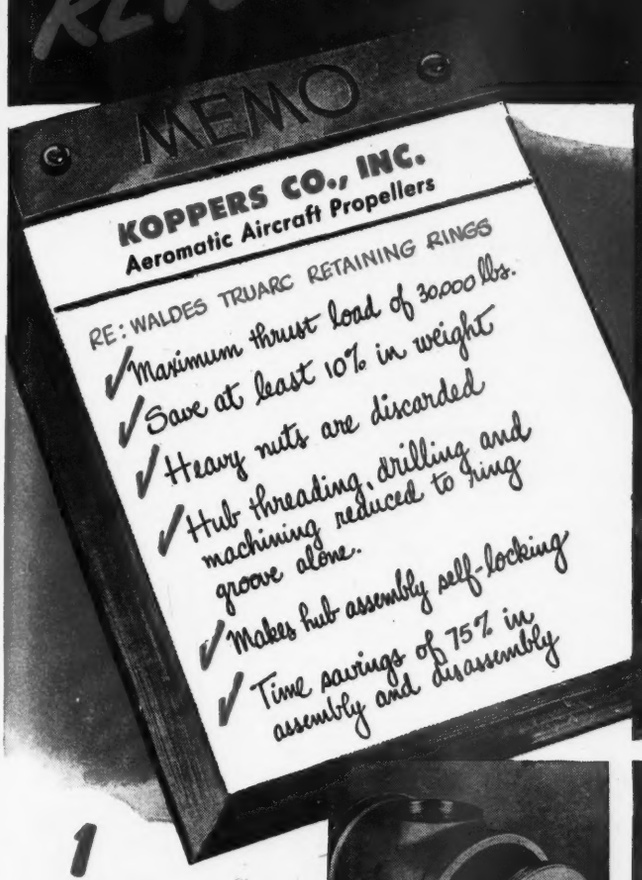
Please send me complete information on your Metal Stitchers.
We Rivet _____, Spot Weld _____, Type and Thickness of Material _____

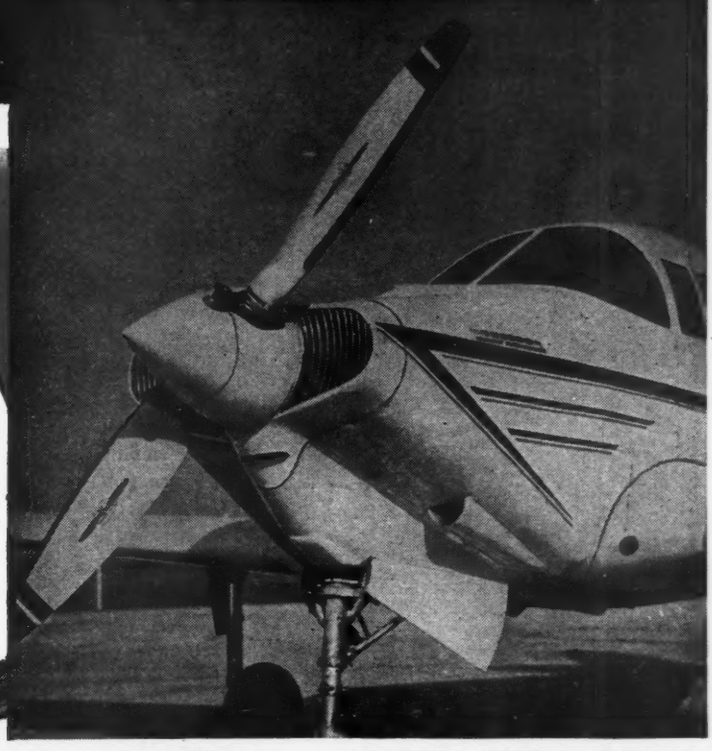
Name .....

Company .....

City ..... *State* .....

AEROMATIC AIRCRAFT PROPELLER DESIGN REVOLUTIONIZED WITH WALDES TRUARC RETAINING RINGS


MEMO
KOPPERS CO., INC.
Aeromatic Aircraft Propellers
RE: WALDES TRUARC RETAINING RINGS
✓ Maximum thrust load of 30,000 lbs.
✓ Save at least 10% in weight
✓ Heavy nuts are discarded
✓ Hub threading, drilling and machining reduced to ring groove alone.
✓ Makes hub assembly self-locking
✓ Time savings of 75% in assembly and disassembly

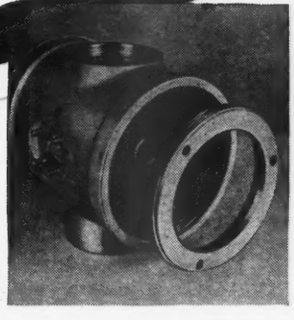


AEROMATIC AIRCRAFT PROPELLERS are standard equipment on the Rocket 185, illustrated above.

1

BEFORE TRUARC—

High centrifugal loads generated by whirling blades of automatic variable pitch propellers were borne by a buttress-threaded nut screwed into the hub. This meant expensive machining, extra weight.

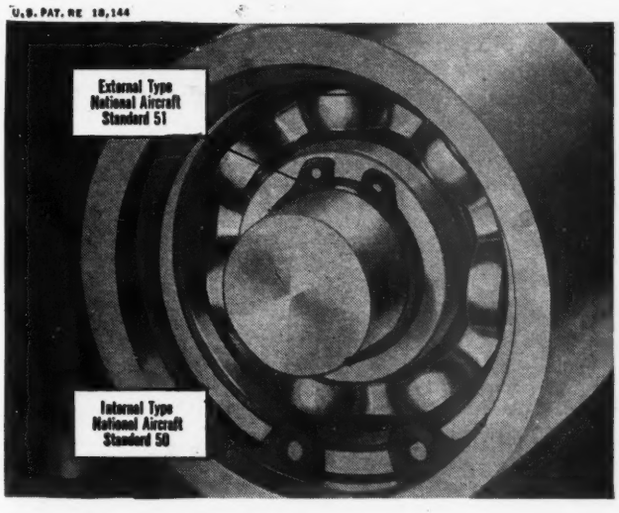


2

AFTER TRUARC—

Elimination of conventional nut greatly reduced weight —cut machining time and cost 75% — made overall maintenance easier. Truarc retention strength against tons of centrifugal force is 3 times greater than operating load.

U.S. PAT. RE 18,144



Waldes Truarc Retaining Rings are used to save weight, space, cost and time in a wide range of products. For holding and positioning machine parts they offer definite advantages over nuts, shoulders, collars and pins. They simplify and speed up production. They can be put on and taken off again and again—and still retain the perfect circularity which gives them their never-failing grip. Test them yourself. We'll furnish samples and complete data. Write Dept. E-2.

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ONE after another, the new personal planes are coming off the drawing boards, off the production lines, into the air. Never in the history of aviation were there so many, never was competition keener. That is one reason why the order of *improved performance* is the order of the day. The new ships—such as the new Ercoupe, shown above—are finer, smoother, faster. But there is one thing that remains unchanged—the designers' preference for Sensenich Propellers as Standard Equipment. No other propeller is chosen so often by so many.

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*That, as the saying goes, Mr. Bullington, is the catch. A plane that works like Aladdin's lamp just isn't to be had . . . no matter how many strings you pull. Despite all the "miracles" developed in the last few years, it'll still take a little effort to fly 'em. That's why, until the automatics do come along, we suggest that you watch for the new, improved WACO . . . the plane that *is* comfortable, dependable and easy to fly . . . soundly designed and ruggedly built for all-weather performance . . . a better plane for better flying. THE WACO AIRCRAFT COMPANY, 112 Peters Avenue, Troy, Ohio, U. S. A.

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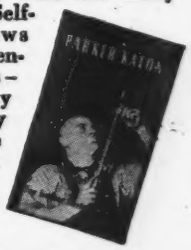
"HOW TO USE" Booklet – FREE. Get acquainted with the many types of P-K Self-tapping Screws and other Fastening Devices – learn how they cut assembly costs, improve products. Ask for Booklet No. 480.



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Designing in magnesium doesn't require a radical shift from standards you've been accustomed to. Look at the page of recommendations reproduced above. A boss here, a fillet there, a little extra thickness; such rules are simple and, usually, good design in any metal.

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With the race for markets in full swing, electrical manufacturers are eliminating costly production bottlenecks by providing *uniform dependability* in testing procedure all along the line. From the inspection of purchased components right through to final product inspection, they insure accurate testing by using instruments they can trust.

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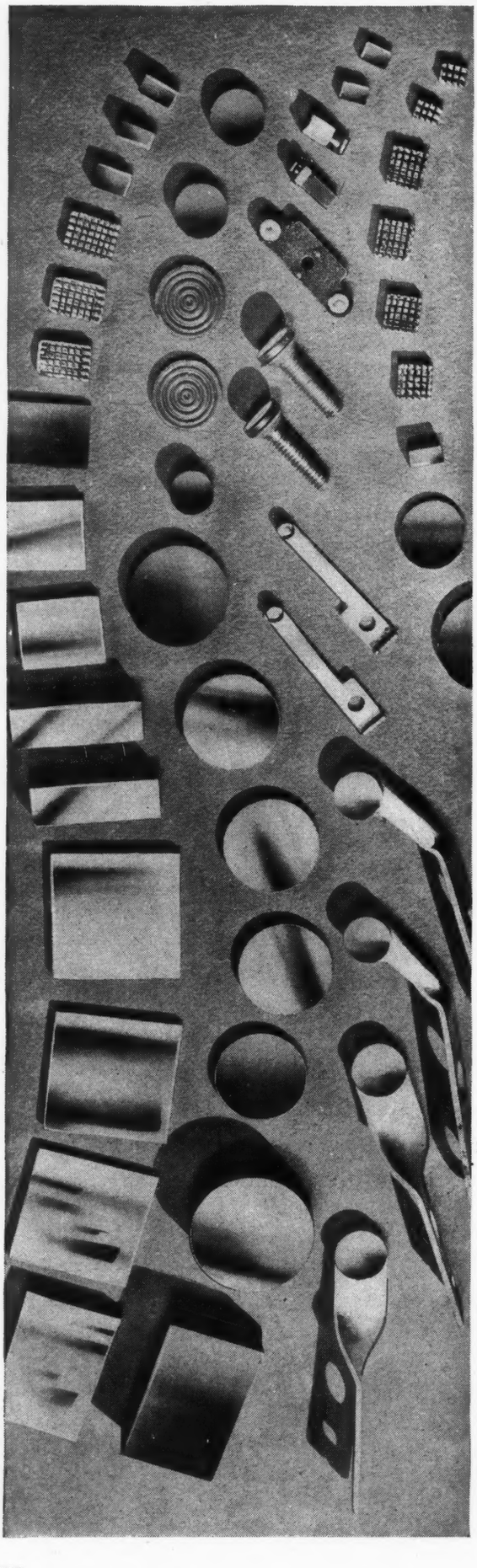

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ROMEC G-9

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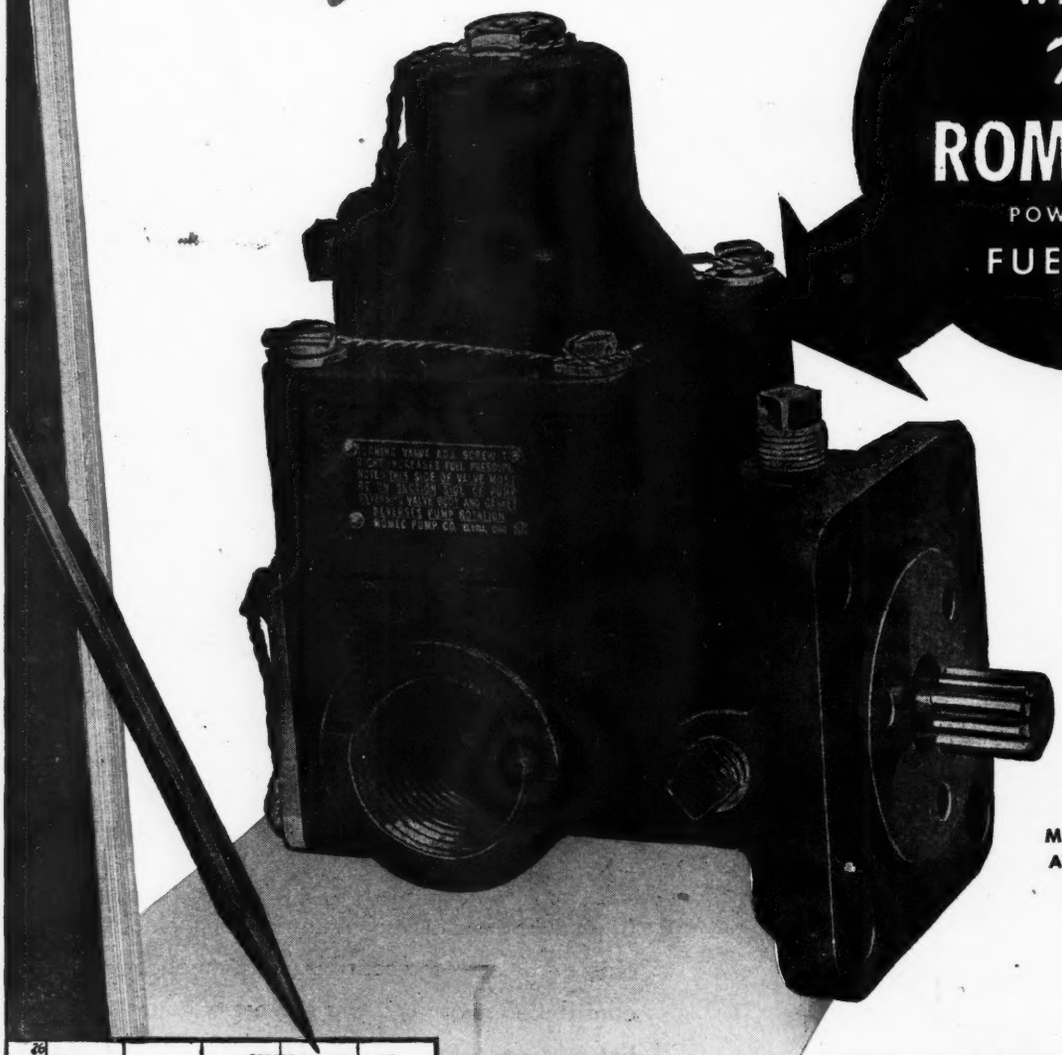

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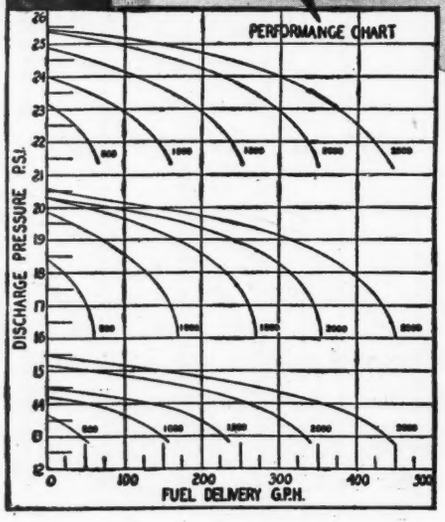

Here is a fuel pump that will be in big demand for postwar planes. With its higher pressure range of from 6 to 35 lbs., its 400 gallon per hour capacity at 2500 rpm., and its low weight of only 2¾ lbs.—It's a winner.

Built with a balanced type relief valve with shaft seals that are dependable through extreme temperature ranges. This pump is now in production.

In writing, kindly refer to type G-9.

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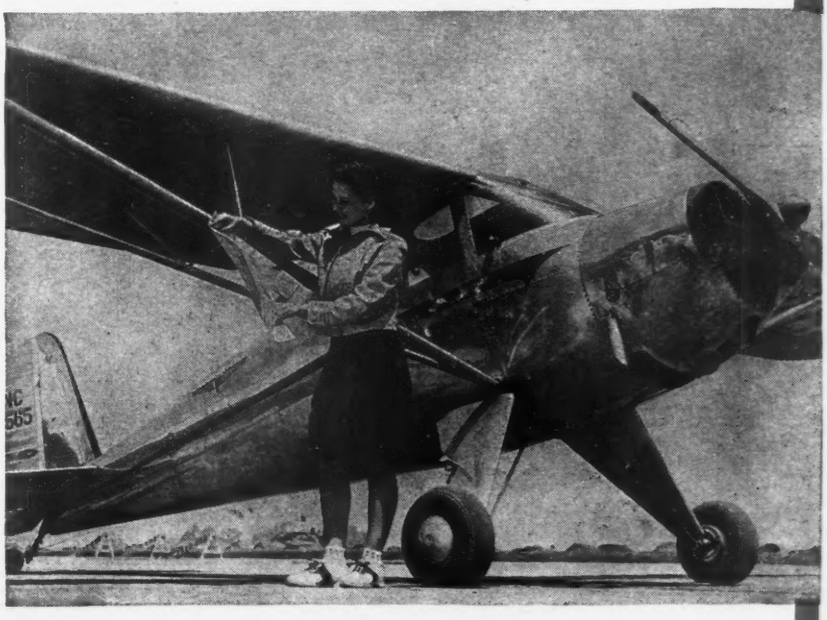

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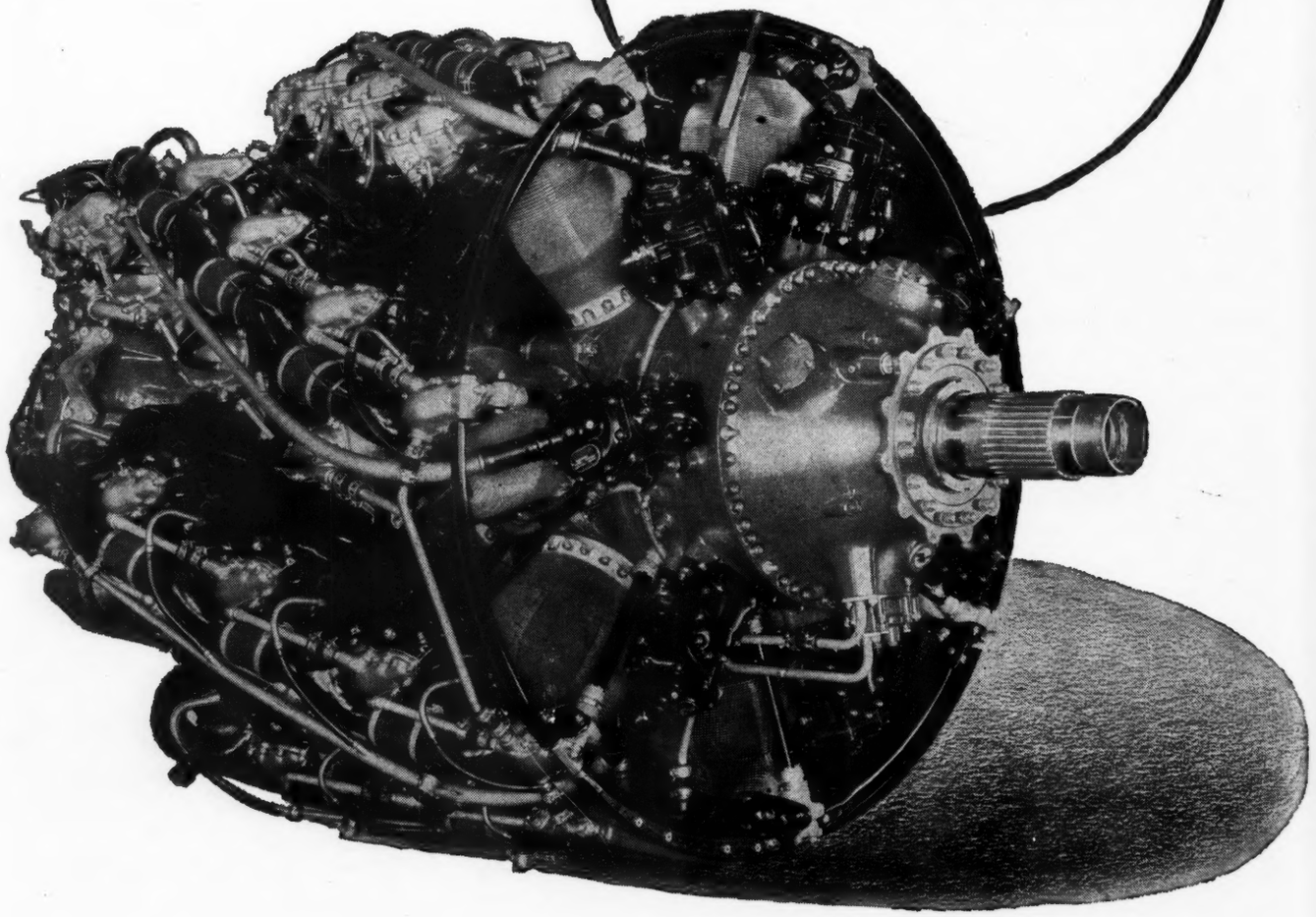
NEW 28-CYLINDER, FOUR-ROW RADIAL AIR-COOLED ENGINE, DELIVERS MORE THAN 3650 COMBAT HORSEPOWER



This outstanding Pratt & Whitney Power Plant is equipped with seven D4RN-2 BENDIX SCINTILLA AIRCRAFT MAGNETOS with their radio shielding harnesses and pressure pump.

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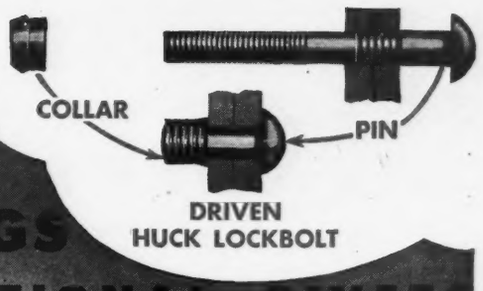
UNIQUE *Huck Lockbolt* OFFERS WORTH-WHILE SAVINGS OVER BOLTS AND CONVENTIONAL RIVETS



On both production assembly and maintenance work in all materials where either bolts or conventional rivets are used, the Huck Lockbolt offers important savings in assembly time and cost. Consider these proven advantages:

USED IN PLACE OF RIVETS

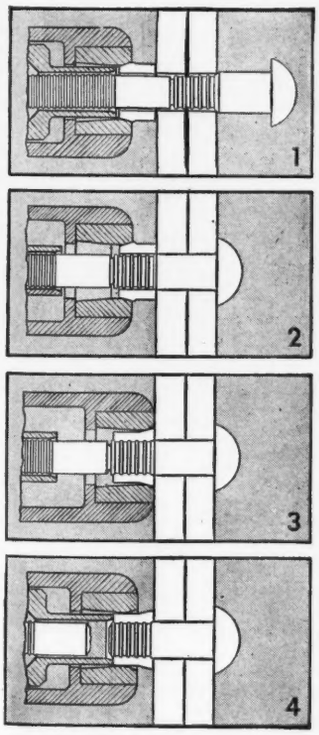
Huck Lockbolts eliminate all bolting-up operations—thus permit much faster assembly. They also permit the use of materials having greater shear strength than rivets. Positive and complete hole filling is provided, with liberal hole size tolerances.

USED IN PLACE OF BOLTS

Huck Lockbolts save much time and trouble. They are installed more quickly and easily than bolts—eliminate lockwashers, cotterpins and nuts—provide hole filling when desired—assure uniform tightening—and fasten as permanently as a rivet.

ENTIRELY NEW OPERATING PRINCIPLE REQUIRES TOOL ACCESSIBILITY TO ONLY ONE SIDE OF WORK

This ***new type of fastener*** consists of two precision-made parts—(1) a ***pin,*** which has a head of any type desired; and (2) a ***locking collar.*** The sectional drawings below show four stages in the rapid, continuous driving operation.



1. After the pin is inserted in the work, the collar is slipped onto the pin and the gun is applied. The gun jaws (not illustrated) automatically engage pull grooves in the pin.
2. The initial pull of the gun on the pin squeezes the work together between the collar and the head of the pin in the equivalent of a bolting-up operation. At the same time, when hole filling is required, the pin is drawn to a press fit in the hole.
3. The increased pull on the pin then forces the gun anvil over the collar, swaging the collar into the locking grooves of the pin as shown to form a rigid, permanent fastening.
4. A further increase in pull then automatically breaks off the pin at the breakneck groove, approximately flush with the collar; and finally, an extension of the gun jaw collet advances to push the anvil off the collar as illustrated.

Two types of guns are available: A small hand gun, ideal for maintenance jobs, with which 6 to 10 Lockbolts can be driven per minute; and a fast, light-weight pneumatic gun capable of driving 40 or more Lockbolts per minute.

TYPES—MATERIALS—SIZES AVAILABLE

Huck Lockbolts are available in two types—(1) for applications requiring hole filling (to replace rivets and close-fitting bolts), and (2) for use in place of bolts in clearance holes. They are furnished with any type of head desired, and with pins of 24S-T or 75S-T aluminum alloy, carbon steel, or high-strength alloy steel. Lockbolts are now available in 3/16" diameter with grip lengths ranging from 1/32" to 21/32" by 16ths. Lockbolts of smaller and larger diameters will soon be available. Write for further information.

Where the back side of the work is completely inaccessible, HUCK BLIND RIVETS may be the answer. For full details, ask for Bulletin 451.

Huck MANUFACTURING CO.

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Tri-Sure Closures Give 8.34 Ounces More Per Drum

Photograph of T-square placed across the closure fitted in the drum clearly shows the flush fitting of the flange which allows complete drainage.

ONE of the major oil companies recently made exhaustive tests to determine the efficiency of drum closures from the standpoint of drainage.

Tri-Sure and other types of closures were tested in 55 gallon drums under identical conditions. After draining the contents (Lube Oil) from the drums only 3.38 fluid ounces remained in those fitted with Tri-Sure Closures, the average contents remaining in all other drums being 11.72 fluid ozs.

Benefit to users of Tri-Sure fitted drums — 8.34 fluid ounces — the equivalent of more than 600 gallons in every 10,000 drum shipment.

In addition, drums sealed with Tri-Sure Closures assure protection from leakage, seepage, tampering, substitution and breathing.

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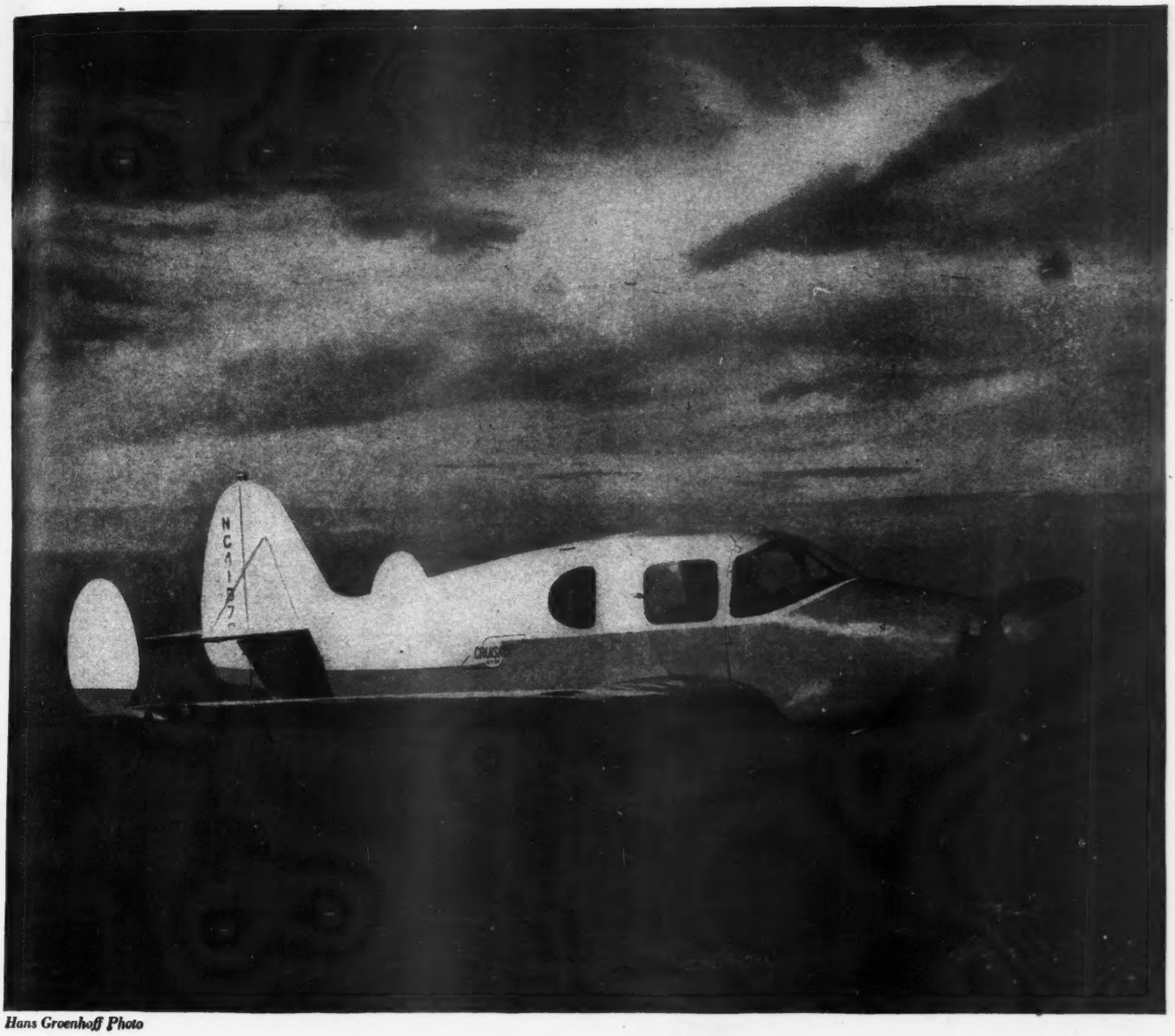

Hans Groenhoff Photo

First Family Plane with 150 mph Cruising Speed

PERFORMANCE!

Pilot Herbert Venable and Executive Engineer B. Salvadori report the following actual results (corrected to standard air) of flight tests conducted January 11, 1946, over a measured course of 3.738 statute miles at New Castle, Del., at sea level:

Top Speed (at 2,700 rpm)...169.2 mph
Cruising Speed (at 2,435 rpm) 153.6 mph
Best Rate of Climb.....1,130 ft./min.
Take Off Run (no wind).....485 ft.
Stalling Speed (flaps).....45 mph

Cruisair Senior equipped with Aeromatic propeller and loaded to full gross weight of 2,100 lbs.

Another Bellanca first is this thoroughly modern four-place airplane, featuring retractable landing gear, full-cantilever low-wing—resulting in outstanding performance. The new Bellanca Cruisair Senior is another in the long line of historic Bellanca thoroughbreds initiated in 1911—possessing inherent stability, dependability and ruggedness. Smart, modern cabin interior styling, with radio loudspeaker concealed beneath upholstery, pilot's map compartment, dome light and molded Plexiglas windshield. This latest Bellanca has all the features you have been looking for in a private plane—family-size seating capacity, speed, economy and efficiency—priced at $5,375 flyaway New Castle. Write today for name of nearest distributor in Bellanca's coast-to-coast sales and service organization. Bellanca Aircraft Corporation, New Castle, Delaware.

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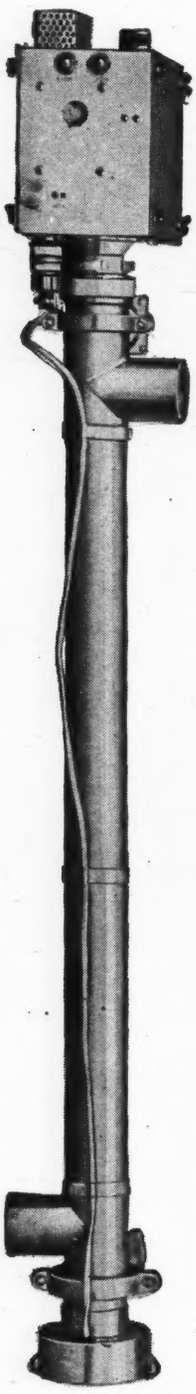
SMOKE DETECTORS for airplane baggage compartments



Fast-extinguishing Kidde carbon dioxide systems have long been protecting airplanes from engine fire. Both combat fliers and commercial pilots know how effectively this system performs.

Now, a new Kidde development offers effective detection of fires *in the baggage compartment.*

A photoelectric cell in the Kidde Smoke Detector spots the first wisp of smoke that warns of fire in its earliest stages. Instantly, a red light flashes on the instrument board . . . alerting the crew before the fire can grow.

A Kidde Extinguisher does the rest!—smothers the blaze quickly, without damage to cargo.

Kidde Smoke Detection is readily adaptable to new or existing transport planes. Plane manufacturers and airlines are invited to write to Kidde for full details.

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The word "Kidde" and the Kidde seal are trade-marks of Walter Kidde & Company, Inc.

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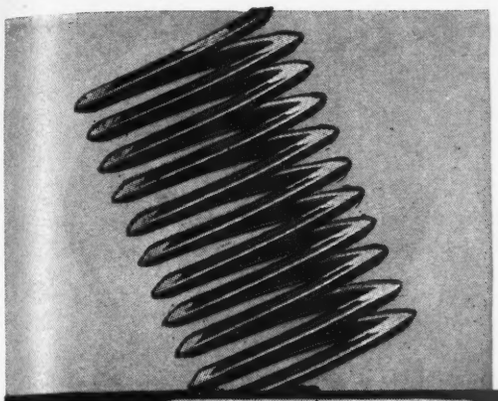
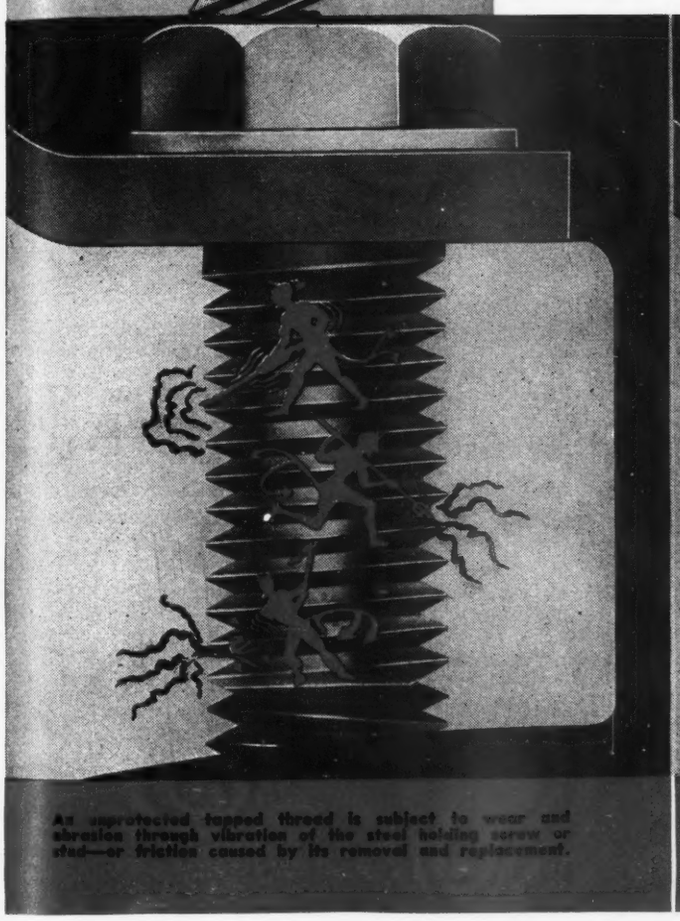
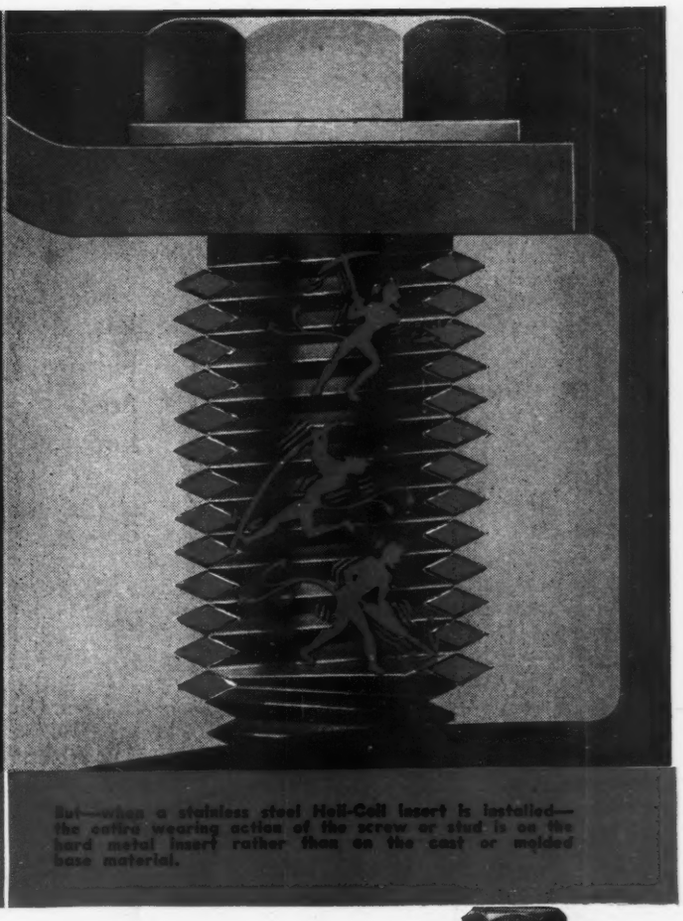


Heli-Coil INSERTS PUT STEEL ARMOR ON TAPPED THREADS!



An unprotected tapped thread is subject to wear and abrasion through vibration of the steel holding screw or stud—or friction caused by its removal and replacement.



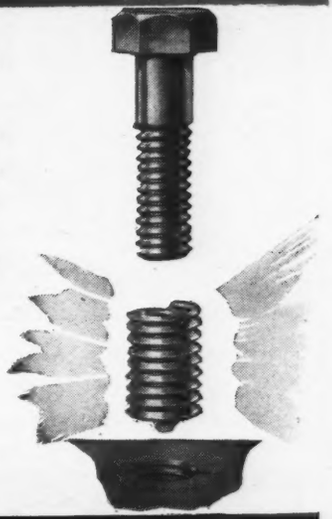
But—when a stainless steel Heli-Coil insert is installed—the entire wearing action of the screw or stud is on the hard metal insert rather than on the cast or molded base material.

Heli-Coil Screw Thread Inserts are helical coils of stainless steel or phospher bronze wire. They protect tapped threads in ferrous or non-ferrous metals, plastics and other cast or molded materials—against abrasion, stripping, seizing and galling.

They are installed much faster than solid bushings—occupy less than half as much cross-sectional area—weigh one-fifth as much as solid bushings of the same inside diameter.

Heli-Coil Inserts are being used today in ever-increasing numbers throughout industry, both as original parts in manufacture, and for repair of damaged threads. Write for your copies of latest Heli-Coil engineering literature.

U. S. and Foreign Patents Issued and Pending



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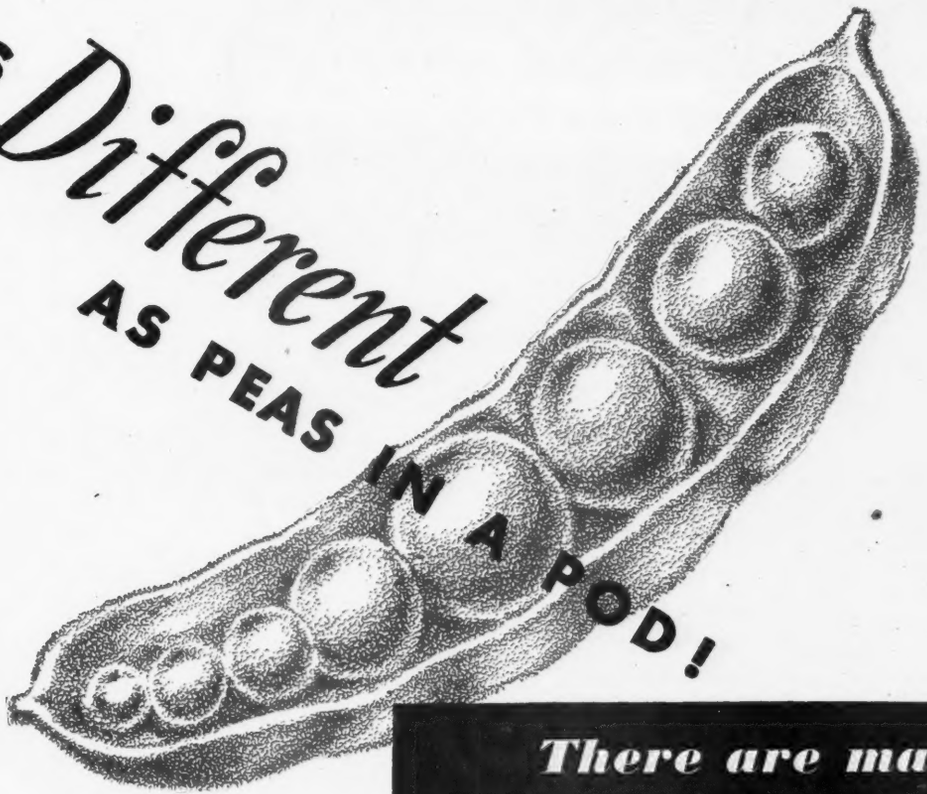

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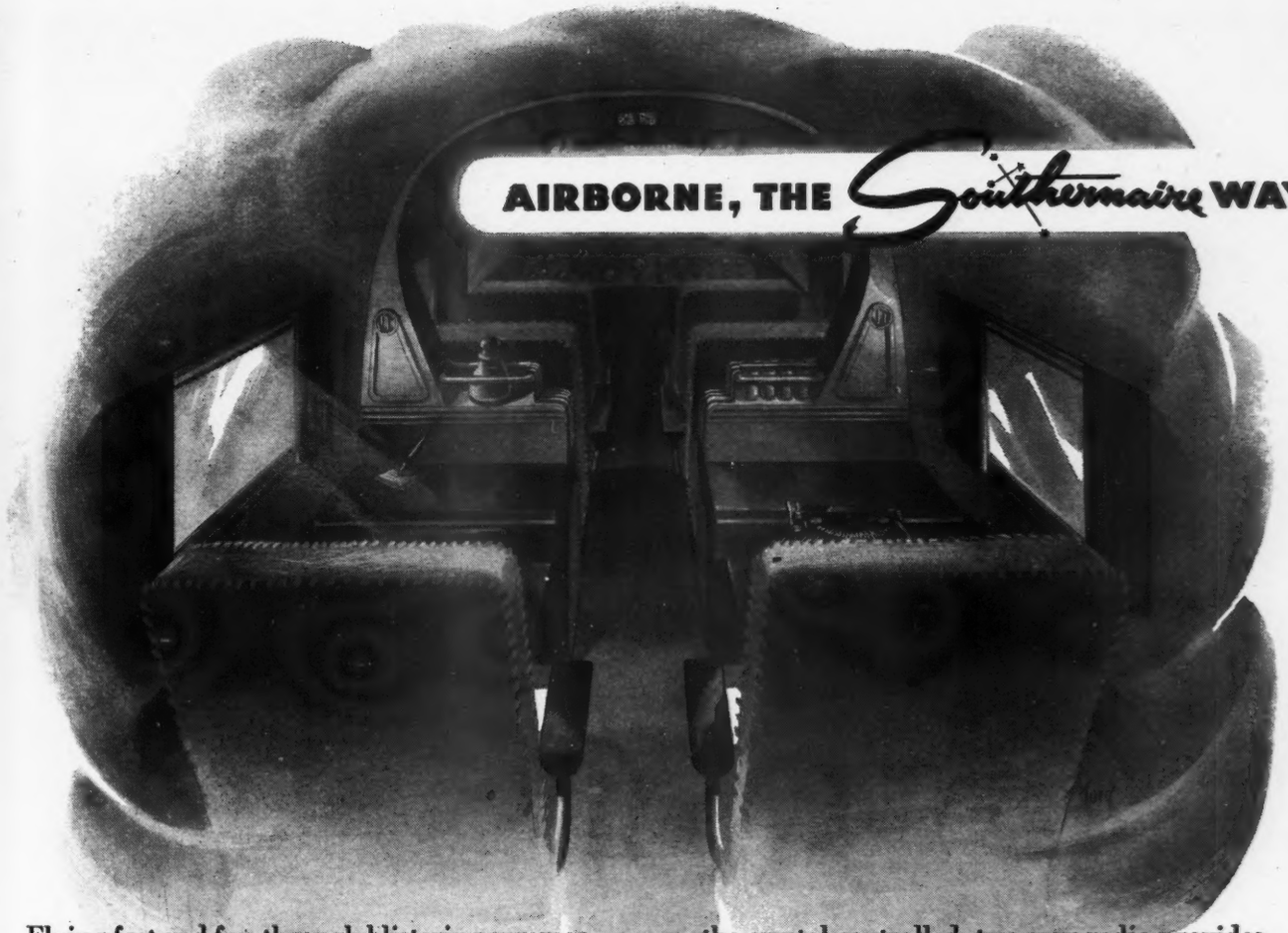

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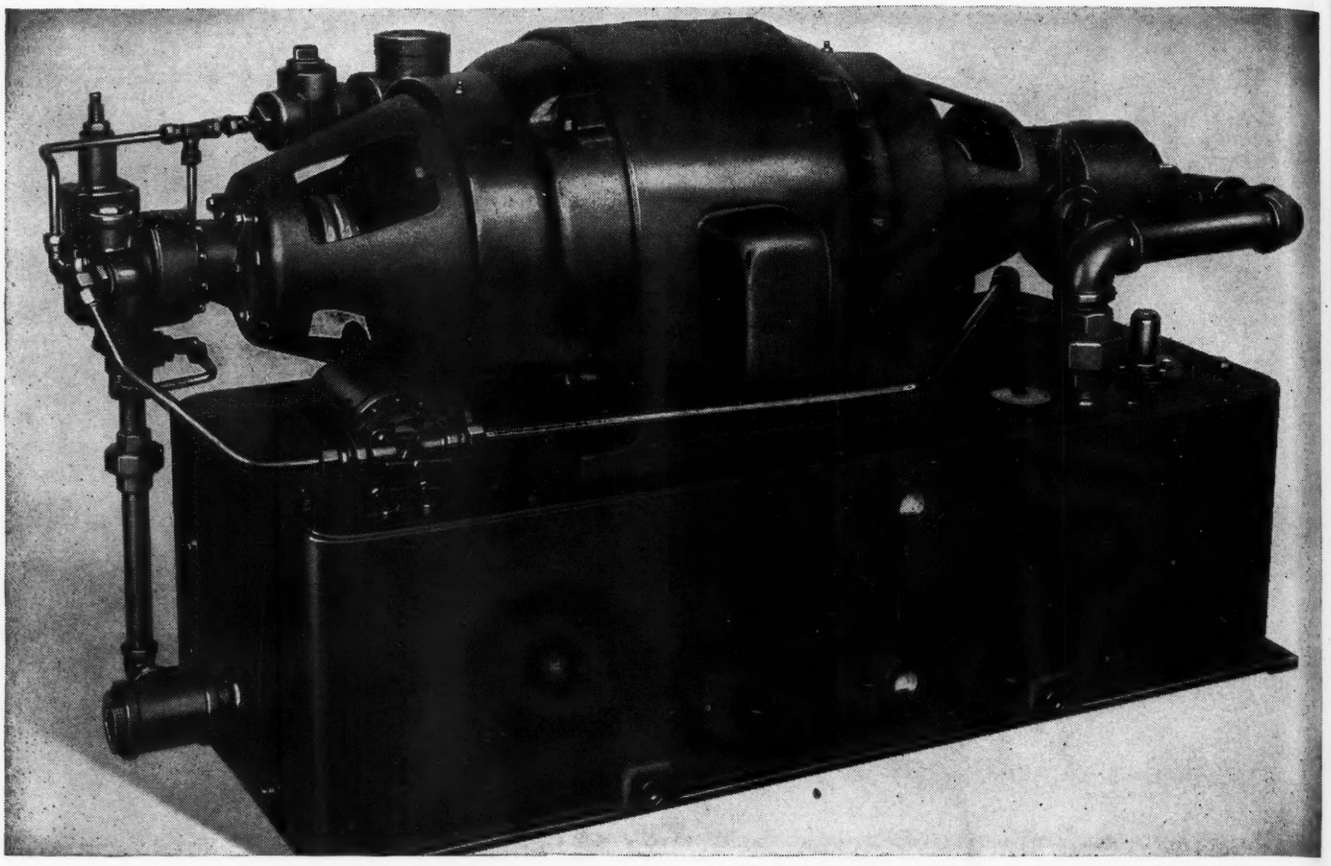

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Unit with cover open

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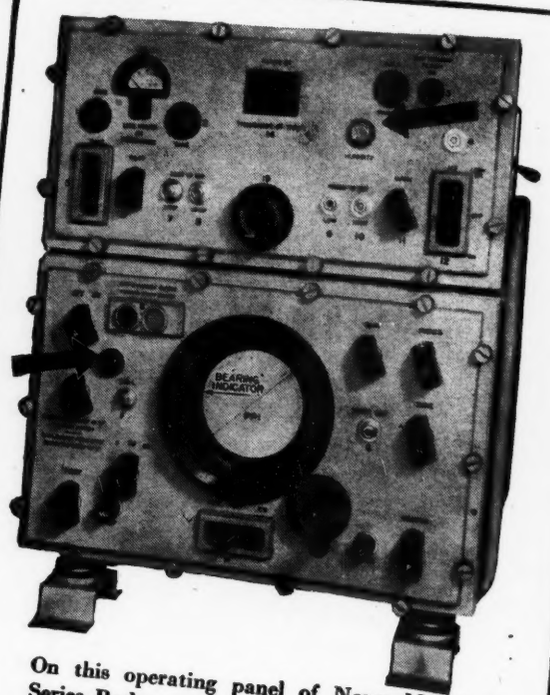
Vital Navy Radar equipment protected from damaging moisture by Chandler-Evans Protek-Plugs!

In the recessed cover of an access door on this Navy Model SO Series Radar Transmitter Receiver Unit are two Protek-Plugs. Another, shown on the side of the case, serves as an indicator to tell when those inside should be removed and fresh ones inserted.



On this operating panel of Navy Model SO Series Radar equipment are shown the ends of two Protek-Plugs. These are also merely indicator plugs, telling when those within the unit have reached the saturation point.

Small, inexpensive little products — but CECO Protek-Plugs did a big job during the war. These transparent plugs are filled with silica gel, a substance with amazing adsorptive powers. Treated with a blue dye, they gradually turn pink as they reach saturation, indicating exactly when they should be replaced by fresh ones.

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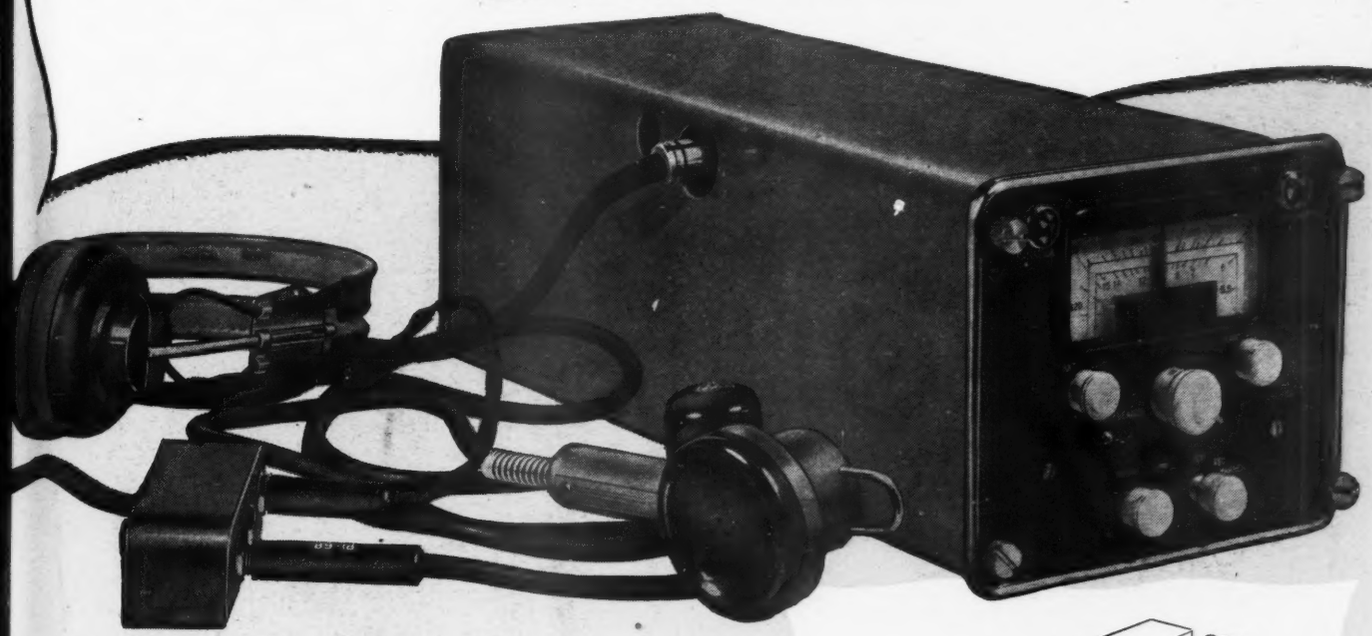

Skillfully created by radio engineers whose own flying experience dictated the rigid operating specifications upon which it is constructed, the Raytheon Radiophone offers the ultimate in flight performance . . . clear cut transmitter and receiver signals for conversation between pilot, control tower and range stations . . . undistorted reception of the "beam" . . . built-in range filter . . . accurate signals from marker beacons . . . plus the convenience of standard broadcast reception.

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For more detailed information, write today.

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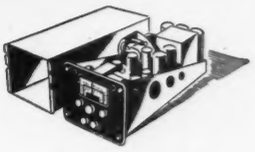

With transmitter and receiver combined in one compact unit, both installation and service problems of the Raytheon Radiophone are simplified. *In a matter of minutes,* the entire unit can be removed and replaced with another Radiophone.

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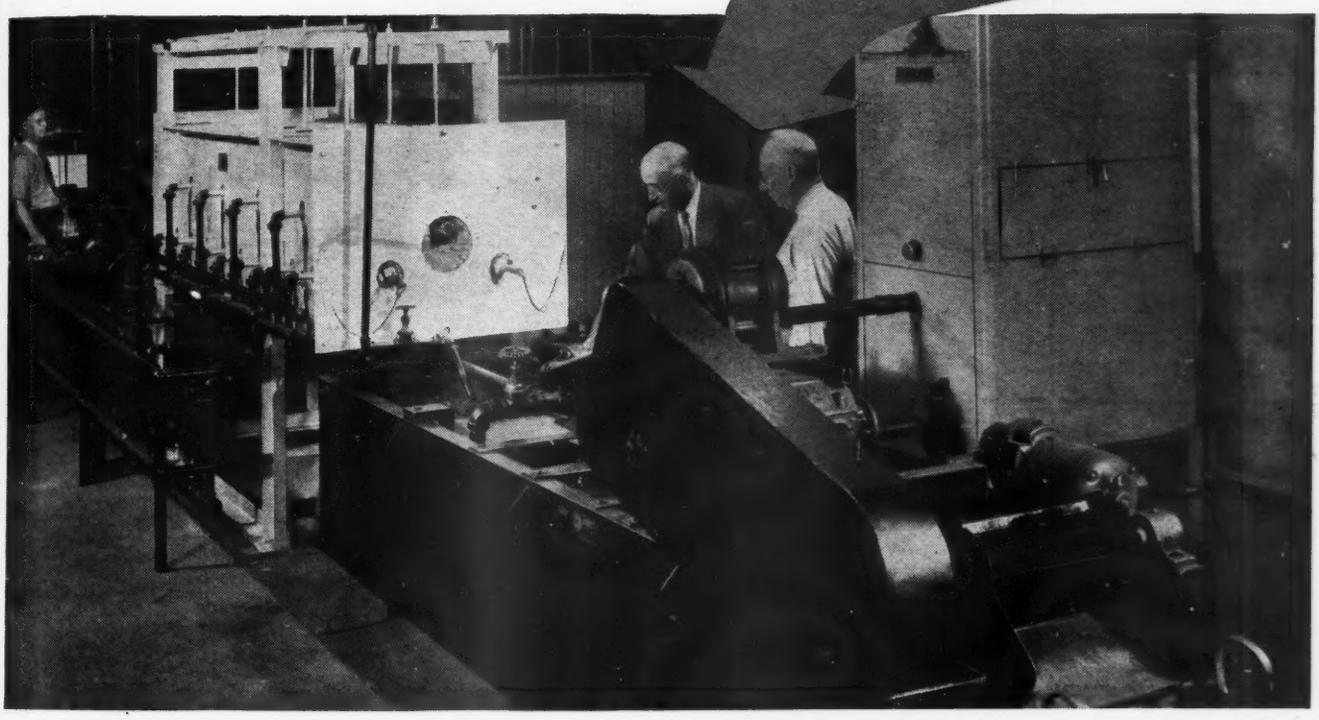

Actual photo of a Chief Metallurgist (right) consulting with a Gulf Service Engineer on results with Gulf Super-Quench in heat treating textile machinery parts.

"We're satisfied that with Gulf Super-Quench we get higher and more uniform hardness in the general run of parts we heat-treat," says this Chief Metallurgist. "In every case this new quenching oil helps us get maximum results."

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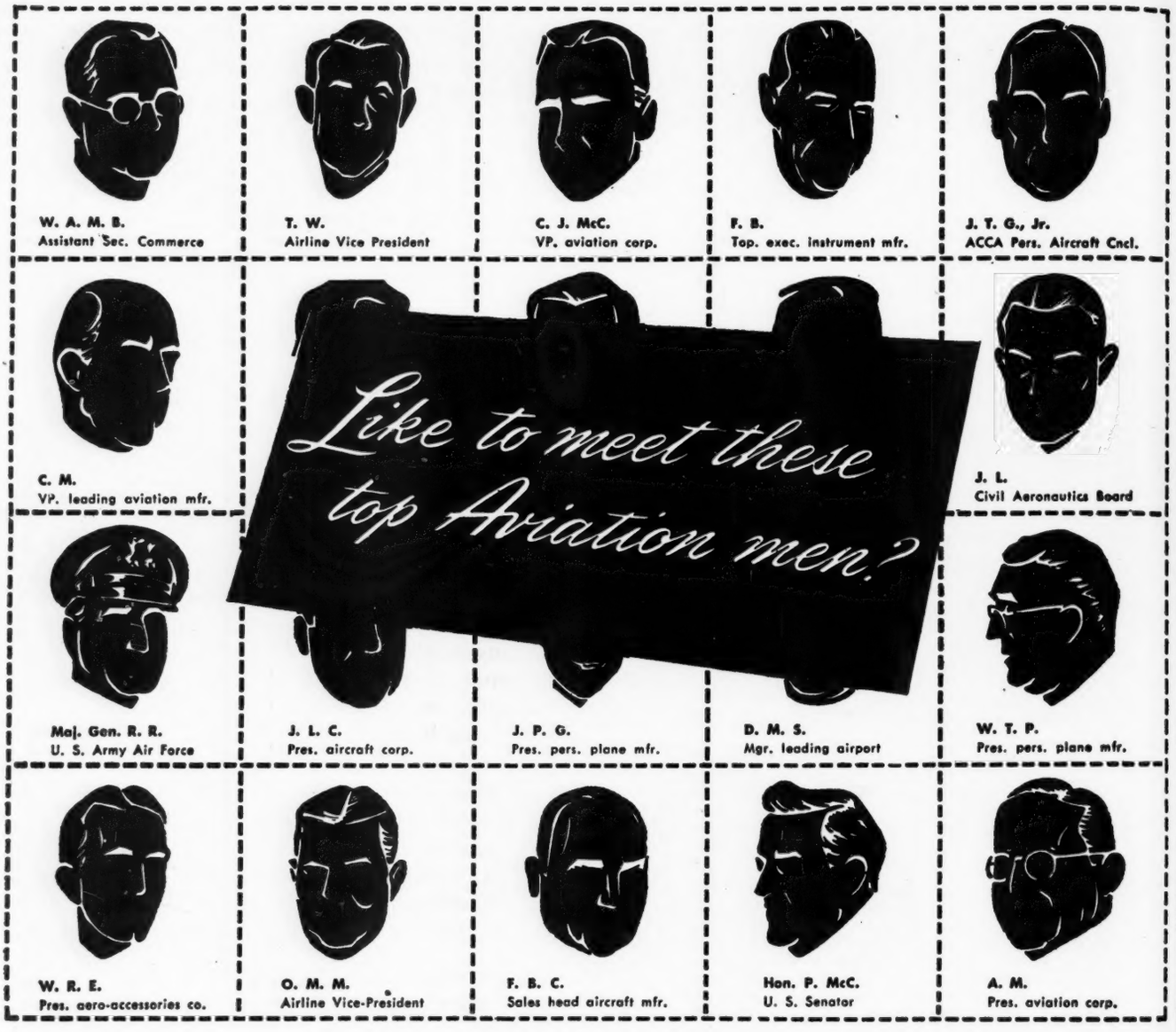

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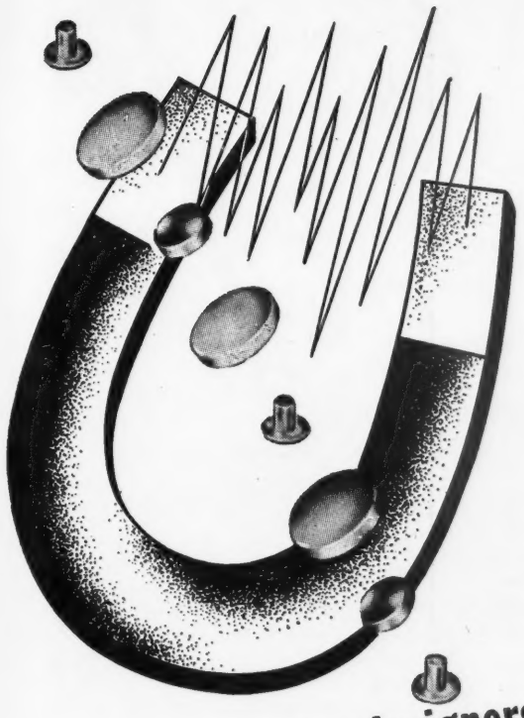
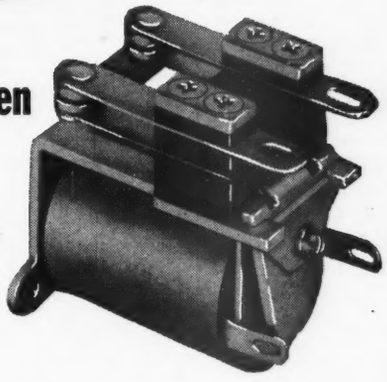


a double-break for designers...

Callite Tungsten contacts in Allied control relays



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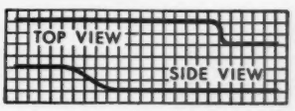
- **TEMPERATURE CONDITIONS**
- **PRESENT SYSTEM**
- **FLEXIBLE OR RIGID HOUSING?**

Make sketches of top and side views of installation. Use regular graph paper and indicate unit of measure.



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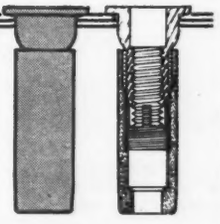
Complete Installation in Seconds

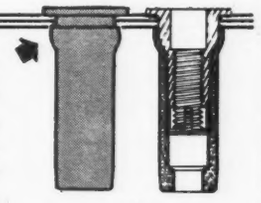
1 Drill ONE Hole

2 Insert LOK-SKRU

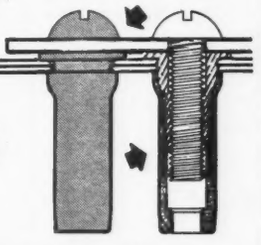
(Types with flat, flush, countersunk or spacer head. Sizes as required for metal thickness and hole diameter.)



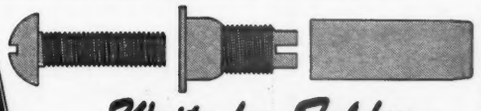
3 Draw LOK-SKRU sleeve against inner side of metal with special power or hand tool, to rivet sheets securely. LOK-SKRU head, tapped for 6, 8, or 10/32 machine screw, provides an anchor nut.



4 Screw, to fasten attachments, is locked in anchor nut by tension grip.



Disassembled LOK-SKRU with screw for attachments



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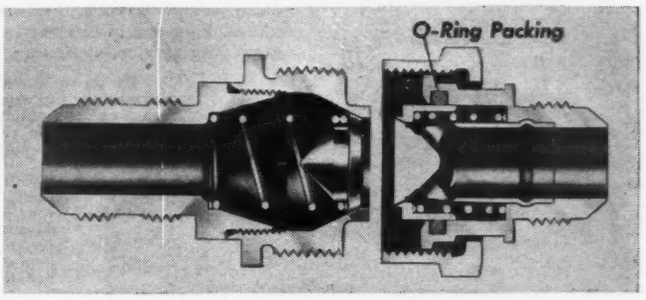
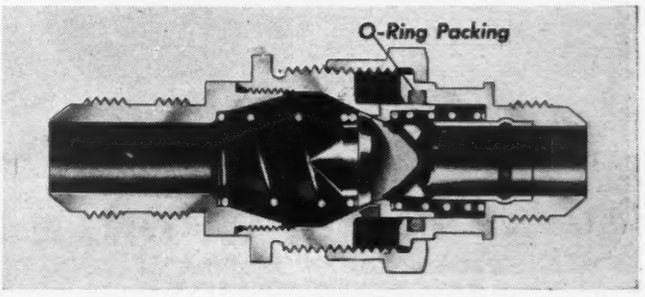
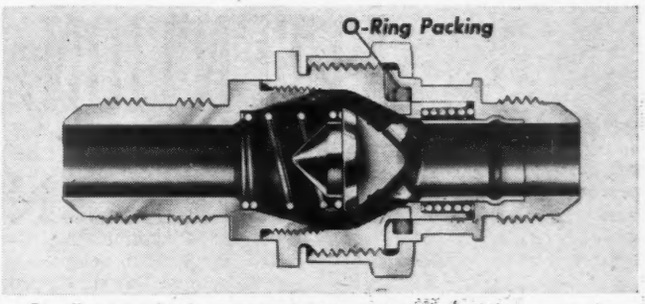


Coupling disconnected: O-Ring provides a seal against external leakage of hydraulic fluid.



Coupling partially connected: O-Ring effectively seals in hydraulic fluid pressure as "poppet" valve prevents air from entering system.



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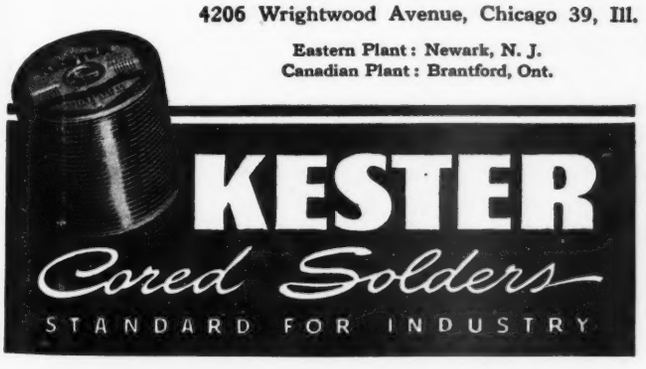

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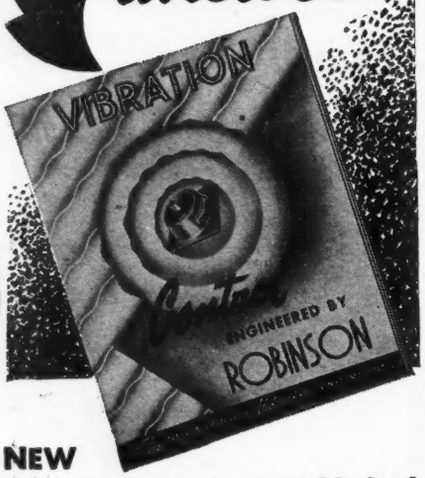

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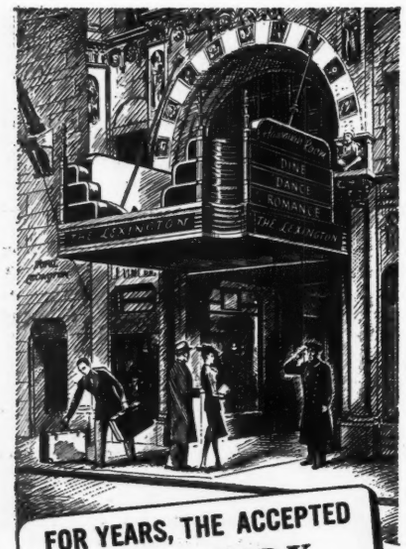

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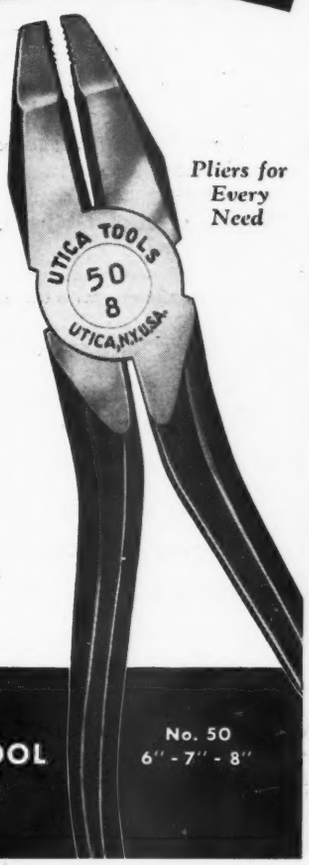

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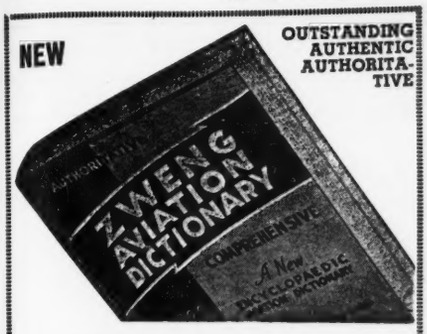

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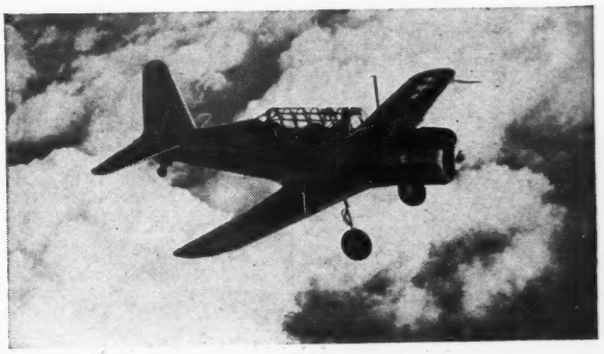

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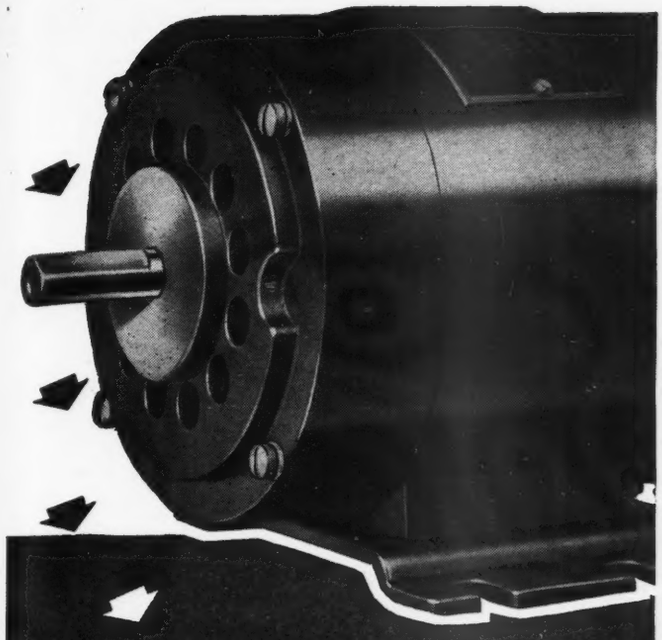

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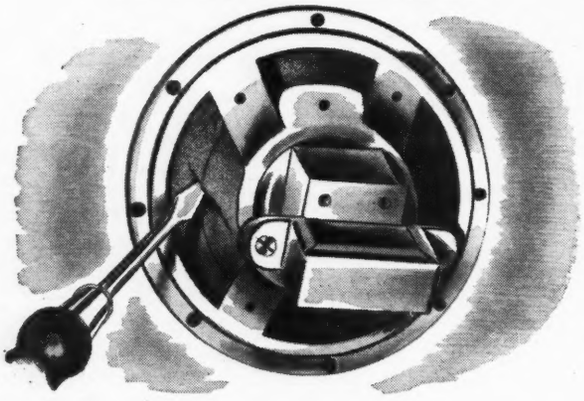

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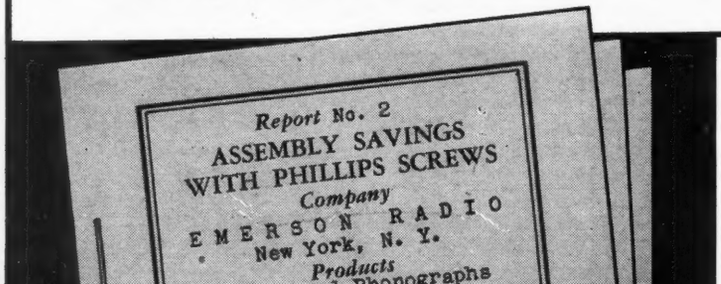

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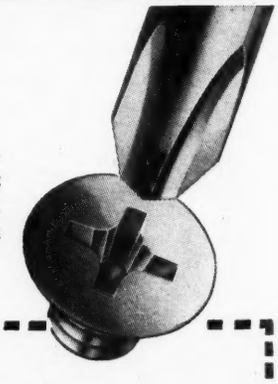

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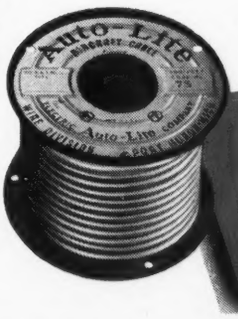

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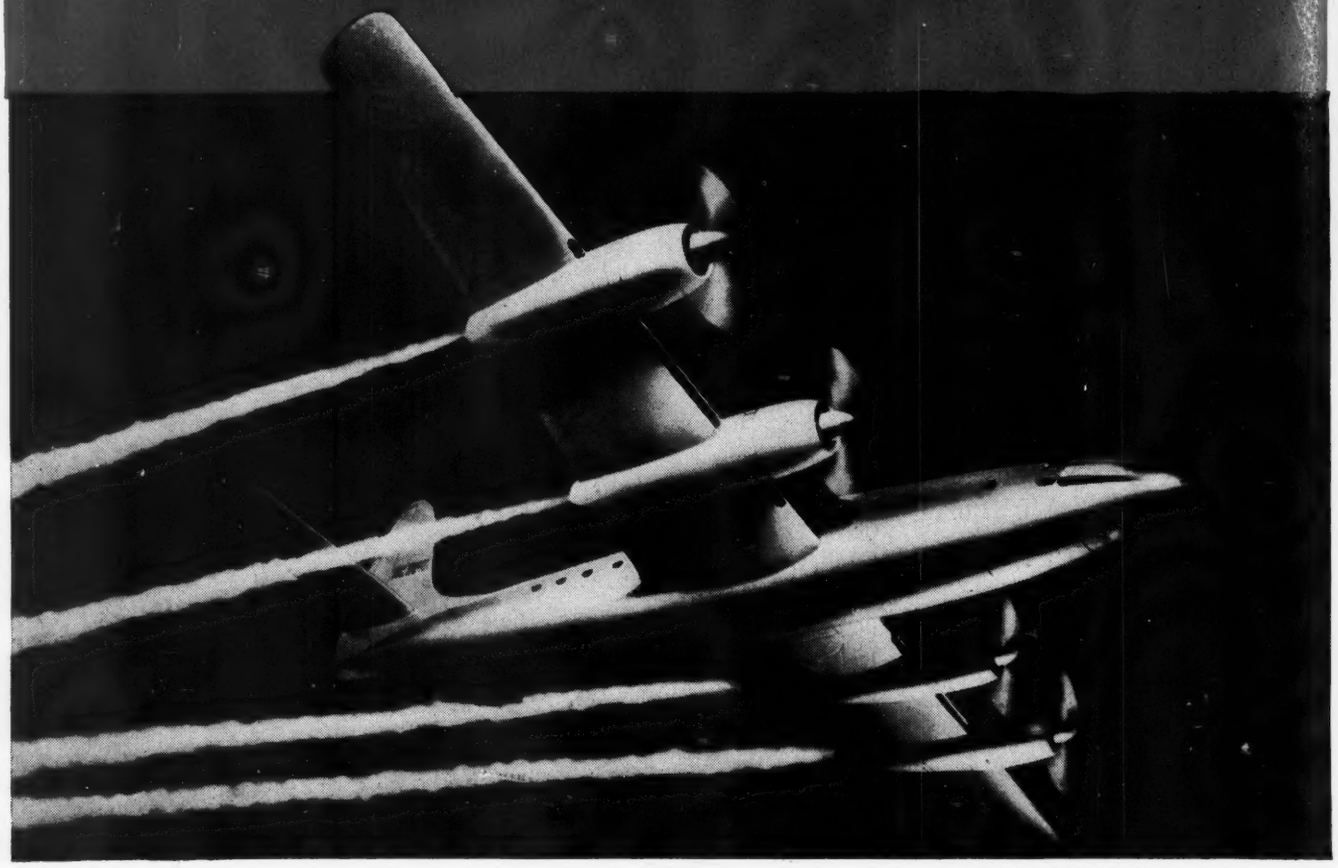

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